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PUBLICATIONS AND PATENTS

January-June 1972

**Agricultural Research Service
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Northern Marketing and Nutrition Research Division
Agricultural Research Service
United States Department of Agriculture
1815 North University
Peoria, Ill. 61604

REQUEST FOR INFORMATION

The results of the research of the Northern Marketing and Nutrition Research Division are published regularly in the technical literature, and public-service patents are secured to cover patentable inventions and discoveries (see page 66). As a convenient guide to our publications and patents, a list with abstracts is published semiannually. The abstracts describe the current research and indicate the progress achieved. Further information on any of the developments, as well as earlier technical papers, may be obtained by writing us.

In conformance with the policy of the Department of Agriculture, Northern Division publications are available to scientists and other specialists, librarians, representatives of the press, and others interested.

Reference to commercial equipment or proprietary products is made as part of the exact experimental conditions. Naming a company or product does not imply approval or

recommendation by the U.S. Department of Agriculture over others not mentioned.

Requests for specific reprints should be by number and addressed to the Northern Division. Those titles marked with an asterisk [*] are not available for distribution.

Most of the publications are in journals that are available in libraries. Photographic copies of most journal articles on research at this Division can be purchased from the National Agricultural Library of the U.S. Department of Agriculture, Beltsville, Maryland 20705.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with the Director of the National Agricultural Library.

Copies of previous lists of publications and patents are available upon request.

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PUBLICATIONS

[Publications marked with an asterisk (*) are not available for distribution. When requesting reprints, please order by number. Use your zip code.]

- 3054 • Oxidation of Alpha-Tocopherol by Singlet Oxygen
G. W. Grams
Tetrahedron Lett. (50): 4823-4825. December 1971

Alpha-tocopherol was oxidized by using $\text{Ca}(\text{OCl})_2\text{-H}_2\text{O}_2$ to generate singlet oxygen chemically, and the products were characterized. The oxidation products were identical with those previously obtained from the dye-sensitized photooxidation of alpha-tocopherol. Apparently alpha-tocopherol is a singlet oxygen acceptor yielding characteristic epoxy ketones. Possibly, alpha-tocopherol protects unsaturated lipids from the effects of photodynamic action by scavenging "active" oxygen.

- 3055 • Aflatoxin M_1 Removal from Aqueous Solutions by
Flavobacterium aurantiacum
E. B. Lillehoj, R. D. Stubblefield, G. M. Shannon,
and O. L. Shotwell
Mycopathol. Mycol. Appl. 45(3-4): 259-266. December 1971

In liquid cultures both growing and stationary phase cells of *Flavobacterium aurantiacum* NRRL B-184 eliminated aflatoxin M_1 . Toxin concentrations of 15 $\mu\text{g/ml}$. and 37.5 $\mu\text{g/ml}$. interfered with bacterial growth, and at the higher level 4.4 $\mu\text{g M}_1$ was removed from the growth medium by a milligram (dry weight) of bacteria. Toxin was completely removed from the liquid medium by incubating 5×10^{10} resting cells per milliliter with 8 $\mu\text{g/ml}$. of aflatoxin M_1 for 4 hours. Attempted recovery of M_1 from cells following incubation of the bacteria with the toxin demonstrated that the M_1 was essentially nonextractable. Bacterial cells also removed aflatoxin M_1 from toxin-contaminated milk.

3056 • Influence of Gluing Conditions on Performance of Crosslinked Protein Glue in Interior-Type Southern Pine Plywood

F. B. Weakley and C. L. Mehlretter

Forest Prod. J. 22(1): 45-50. January 1972

Plywood panels were prepared experimentally by bonding southern pine veneers with a hot press crosslinked protein glue under a variety of conditions. Panels of 3/8-inch, 1/2-inch, and 13/16-inch construction that met the performance requirements of the interior plywood test were obtained by using: (1) veneer of normal or average specific gravity, 0.40; (2) veneer moisture content range at time of gluing, 5-7%; (3) glue spread of 80 pounds per thousand square feet of double glue line (MDGL); (4) maximum assembly time of 20 minutes, which included stand times of 3 minutes before and 5 minutes following the prepress of 3 minutes at 150 p.s.i.; (5) hot press times--5 minutes for the 3/8-inch and 10 minutes for the 1/2-inch panels at two panels per opening and 7 minutes for the 13/16-inch panels at one panel per opening; (6) hot press temperature of 270° F.; and (7) specific pressure in the hot press of 175 p.s.i. High panel production in conventional exterior-type southern pine plywood manufacturing facilities can be expected to be realized with this glue at a glue cost of approximately \$2/MDGL.

3057 • Scanning Electron Microscopy

F. L. Baker and L. H. Princen

Encycl. Polym. Sci. Technol. 15: 498-507. 1971

The unique position of the scanning electron microscope and its role in relation to the optical microscope and the transmission electron microscope are explained. Image formation and contrast, degree of magnification, resolution, and depth of focus are briefly described along with the mechanical and electronic principles of the instrument. Some examples of the utilization of the scanning electron microscope in polymer research are given. Studies on adhesives, dental restoration, fracturing of plastics, foamed plastics, and organic coatings are mentioned specifically.

3058 • Biochemistry of Milky Disease: Radiorespirometry of Pyruvate, Acetate, Succinate, and Glutamate Oxidation by Healthy and Diseased Japanese Beetle Larvae

Lee A. Bulla, Jr., and Grant St. Julian

J. Invertebr. Pathol. 19(1): 120-124. January 1972

Oxidation of pyruvate, acetate, succinate, and glutamate was compared in healthy third-instar Japanese beetle (*Popillia japonica*) larvae and in those infected with the milky disease bacterium, *Bacillus popilliae*. Both healthy and infected larvae oxidize these compounds via the tricarboxylic acid cycle. However, oxidation of all compounds, except succinate, is

higher in healthy than in infected larvae. The oxidation rate of all four compounds varies throughout the infectious process. As the disease progresses, oxidation of pyruvate and glutamate is greatest in phase I when there are no observable bacterial cells within the larval hemolymph. Oxidation of acetate and succinate increases in phase II, characterized by rapid vegetative growth of the bacteria. The oxidation rate of acetate and succinate decreases upon further disease development (phases III and IV), when there is a greater demand for energy compounds and for biosynthetic intermediates by the bacterial cells in transition from vegetative growth to sporulation.

3059 • Sporulation of *Bacillus popilliae* in Liquid Cultures

William C. Haynes and Lenora J. Weih

J. Invertebr. Pathol. 19(1): 125-130. January 1972

In 1966, Haynes and Rhodes reported that *Bacillus popilliae* NRRL B-2309S formed spores in liquid J-medium containing activated carbon. Although yields of a few hundred thousand spores per milliliter were ultimately obtained, the numbers in subsequent experiments diminished. We reversed this trend by using inocula composed of spores formed in successful experiments. The spores used had been stored as dry films for as long as 11.5 months. Inasmuch as Haynes and Rhodes (1969) showed that the resistant cells formed early in the sporulation cycle are probably pre- or immature spores, we were interested in comparing their efficacy in evoking sporulation with that of mature spores from later stages of the cycle. We found that early cycle forms engender relatively few refractile spores, whereas mature spores yielded as many as 31×10^6 /ml. Better than 90% of the spores were accompanied in sporangia by typical refractile parasporal bodies.

3060 • Mating Responses in the Yeast *Hansenula holstii*

Alberta I. Herman

Antonie van Leeuwenhoek J. Microbiol. Serol. 37(3):
275-280. 1971

Fertility among compatible stocks of the yeast *Hansenula holstii* increased when cells of both sexes were incubated for 24 to 48 hours on a medium that restricted vegetative growth before mass-mating.

3061 • Sex-Specific Growth Responses in Yeasts

Alberta I. Herman

Antonie van Leeuwenhoek J. Microbiol. Serol. 37(4):
379-384. 1971

Growing cells of complementary mating types from two genera of yeasts, *Saccharomyces* and *Hansenula*, exhibited sex-specific responses. Two kinds of responses were observed. Either one of the sexes grew preferentially toward its mate which ceased to bud and increased in size, or both mating types grew preferentially toward each other. A growth response was observed between mating types of *Saccharomyces cerevisiae* and *Hansenula anomala* presumably complementary.

3062 • Substituted Methyl α -D-Glucopyranosides: A Relationship Between Structure and Thin-Layer Chromatographic Behavior

H. B. Sinclair

J. Chromatogr. 64(1): 117-121. January 1972

Twenty substituted methyl α -D-glucopyranosides were separated by thin-layer chromatography with solvent mixtures of toluene and ethyl acetate. From R_F values and the Martin equation relating R_M with R_F , a relationship between chemical structure and chromatographic behavior was determined. Group constants, position parameters, and a solvent parameter were evaluated. Using these values, an R_M can be calculated from the number of functional groups, their position on a methyl α -D-glucopyranosyl group, and a solvent parameter.

3063 • Sensory Evaluation of Commercial Soy Flours, Concentrates, and Isolates

J. E. Kalbrener, A. C. Eldridge, Helen A. Moser, and W. J. Wolf
Cereal Chem. 48(6): 595-600. November-December 1971

Flavor is one of the main factors limiting wider use of soybean products in foods. To determine the nature of the flavors and their intensities, various commercial soybean flours, concentrates, and isolates were evaluated by a 17-member taste panel. Two-percent dispersions of the samples in charcoal-filtered tap water at room temperature were rated for odor and flavor intensity on a 10-point scale where 10 is bland and 1 is strong. Odor scores ranged from 5.8 to 7.7 and flavor scores, from 4.2 to 7.0. Odor and flavor responses varied for different samples. Odor responses included beany, corn meal, musty, and toasted. Flavor descriptions included beany, bitter, chalky, and astringent. Sample detection thresholds were determined for a raw defatted flour (laboratory prepared), a concentrate, and two isolates. Beany and bitter flavor thresholds were also determined on the same four samples. The data indicated that there were differences in the various samples but that none were truly bland. The threshold values showed that the flavor constituents are detectable in low concentrations.

- 3064 • Laboratory Evaluation of Hexane:Alcohol Azeotrope-Extracted Soybean Flakes as a Source for Bland Protein Isolates
A. C. Eldridge, J. E. Kalbrener, Helen A. Moser, D. H. Honig, J. J. Rackis, and W. J. Wolf
Cereal Chem. 48(6): 640-646. November-December 1971

Most commercial edible soy products in the U.S. are prepared from hexane-extracted soybean flakes. The flavor of these materials prevents their unrestricted use in bland foods and beverages. Possibly defatted flakes can be improved in flavor by re-extraction with azeotropic mixtures of hexane:methanol, hexane:ethanol, or hexane:2-propanol. The nature and intensities of flavors of defatted flakes, azeotrope-extracted flakes, and protein isolates prepared from both types of flakes were evaluated by a taste panel. Samples were rated for odor and flavor. Flavor responses for laboratory-prepared defatted flakes, azeotrope-extracted flakes, and their isolated proteins were beany, bitter, and astringent; but the flavor intensities of the azeotrope-extracted products were lower than for hexane-defatted products.

- 3065 • Differences in Amino Acid Sequences of Gliadin and Glutenin
J. A. Bietz and J. A. Rothfus
Cereal Chem. 48(6): 677-690. November-December 1971

Gliadin and glutenin were examined to identify peptides that differentiate the proteins. Pronase-resistant fragments from gliadin and glutenin have average molecular weights of 460 and 640, respectively, and in acid are readily converted to pyroglutamic acid (PGA) peptides. PGA-peptides isolated from pepsin-hydrolyzed Pronase digests contained glutamine (Gln) or glutamic acid; proline, serine, and glycine were other common residues. Several peptides were common to digests of both proteins; but most were unique, demonstrating sequence differences between gliadin and glutenin. Yield data suggested that most unique peptides were from a single protein or only a few different ones. Glycine occurs more frequently in the PGA-peptides from glutenin; and proline, in those from gliadin. That Gln is also positioned differently in the two proteins was evidenced by the enzymatic release of more PGA from glutenin than from gliadin and more PGA-Gln and PGA-Gln-Gln from gliadin than from glutenin.

3066 • Field Ionization Mass Spectrometry of Long Chain Fatty Methyl Esters

William K. Rohwedder

Lipids 6(12): 906-911. December 1971

Mass spectrometry is particularly useful for identifying lipid materials. One primary factor in the interpretation of mass spectra is recording the molecular ion peak that gives the molecular weight of the compound. Regrettably many compounds, including hydroxy compounds, do not give significant molecular ion peaks, making their identification difficult. A mass spectrometer equipped with a field-ionization source produces a completely different mass spectrum consisting almost entirely of the molecular ion peak. This new source has been used to measure the mass spectra of methyl esters of saturated, unsaturated, and hydroxy fatty acids. The saturated ester gave the molecular ion peak almost exclusively; unsaturated esters recorded molecular ion peaks, plus metastable peaks; whereas the hydroxy esters had molecular ion, M-18, metastable, and fragment ion peaks.

3067 • Metabolism of Labeled Isomeric Octadecenoates by the Laying Hen

T. L. Mounts, E. A. Emken, W. K. Rohwedder, and H. J. Dutton

Lipids 6(12): 912-918. December 1971

Discrimination between octadecenoic acid isomers by the laying hen has been studied using tritium (^3H), carbon-14 (^{14}C), and deuterium (d) labeled oleate and elaidate esters. Hydrogen isotopes were positioned at the double bond, whereas ^{14}C was located in the 1-, carboxyl carbon. The egg acted as a biological trap, providing an automatic daily biopsy with which to study the metabolism of the fed isomers. Monitoring the incorporation of isomers was facilitated by dual label feeding experiments, and $^3\text{H}/^{14}\text{C}$, d_2/d_0 and d_2/d_1 ratios were determined on the isomeric mixtures fed, on the total egg lipids extracted, and on the isolated neutral lipid and phospholipid fractions. Comparison of isotopic ratios of the fed mixture and of the lipid fractions provided an evaluation of discrimination by the hen during the transport of isomeric octadecenoates into the egg lipids. Radioactive and stable isotope ratios determined for the neutral lipid indicated a preferential incorporation of the *cis* isomer. Stable isotope ratios determined for the phospholipid showed that the *trans* isomer is preferentially incorporated. The $^3\text{H}/^{14}\text{C}$ ratios for the phospholipid recovered in each experiment increased greatly whichever isomer was labeled with ^3H , indicating an elimination of the 1- ^{14}C -label. Gas liquid radiochromatographic separation of the methyl esters from the neutral lipids and phospholipids showed that the isotopic labels were present almost exclusively in the octadecenoic acid constituent.

3068 • Ricinoleic Acid in *Linum mucronatum* Seed Oil

R. Kleiman and G. F. Spencer

Lipids 6(12): 962-963. December 1971

Linum mucronatum seed oil contains 15% ricinoleic [(+)-12-D-hydroxy-*cis*-9-octadecenoic] acid, previously unknown in the Linaceae. Identification was made by infrared, gas-liquid chromatography, nuclear magnetic resonance, ozonolysis, and mass spectrometry. Other major components of the oil are oleic acid (24%) and linoleic acid (48%).

3069 • Selective Hydroformylation of Polyunsaturated Fats With a Rhodium-Triphenylphosphine Catalyst

E. N. Frankel and F. L. Thomas

J. Amer. Oil Chem. Soc. 49(1): 10-14. January 1972

Soybean, safflower, and linseed oils and their methyl esters were effectively hydroformylated with a rhodium and triphenylphosphine catalyst system. The product from safflower methyl esters, hydroformylated at 100° C. and 1,000 p.s.i. synthesis gas ($H_2 + CO$), proved to be a mixture of formylstearate, formyloleate, and diformylstearate. At 150° C. and 1,500 p.s.i. synthesis gas the formyloleate was hydrogenated and the product formed was a mixture of mono- and diformylstearates. The unsaturated monoformyl fraction (100° C.) was tentatively identified as a mixture consisting mainly of methyl 9(10)-formyl-*cis*-12- and methyl 12(13)-formyl-*cis*-9-octadecenoates. The saturated monoformyl fraction (150° C.) was a more complex isomeric mixture of methyl formylstearate. The diformyl fractions from hydroformylated safflower and linseed esters were identified as mixtures consisting mainly of 9,12-(10,13)- and 10,12-(11,13)-diformyl-octadecanoates. When hydroformylation of polyunsaturated fats was interrupted, *cis*-unsaturated formyl oils resulted.

3070 • Improving High-Erucic Oilseeds: Chemically or Genetically?

W. H. Tallent

J. Amer. Oil Chem. Soc. 49(1): 15-19. January 1972

Because of evidence that erucic acid may be undesirable in edible products, genetically developed low-erucic varieties of *Brassica campestris* and *Brassica napus* are expected to become a major part of the Canadian and European rapeseed crops within the next few years. In contrast, the objective of work on crambe and related oilseeds in the United States is a reliable domestic source of oil high in erucic acid for industrial purposes. Whether the oil is produced for edible or nonfood uses, however, the glucosinolates that are characteristically present in oilseeds of the mustard family unfavorably influence the use of the byproduct meals as feed. These glucosinolates are the subject of current intensive research, both chemical and genetic. Development of convenient, accurate, and sensitive analytical methods has markedly facilitated this research. To achieve optimum meal

quality, procedures involving aqueous extraction of unreacted glucosinolates are under study. Genetically, a Polish variety of *B. napus* called Bronowski has been found to produce seed having a low glucosinolate content, and individual low-glucosinolate plants of *B. campestris* have been discovered. Crambe exhibits significantly less observable variability than rapeseed. Consequently, the approaches based on chemical research seem more promising, but the possibility of developing a low-glucosinolate, high-erucic *Brassica* adapted to agricultural production in the United States to complement or even compete with crambe is not being overlooked.

3071 • Selective Homogeneous Hydrogenation of Triunsaturated Fats Catalyzed by Tricarbonyl Chromium Complexes

E. N. Frankel and F. L. Thomas

J. Amer. Oil Chem. Soc. 49(1): 70-74. January 1972

The need for a selective catalyst to hydrogenate linolenate in soybean oil has prompted our continuing study of various model triunsaturated fats. Hydrogenation of methyl β -eleostearate (methyl *trans,trans,trans*-9,11,13-octadecatrienoate) with $\text{Cr}(\text{CO})_3$ complexes yielded diene products expected from 1,4-addition (*trans*-9,*cis*-12- and *cis*-10,*trans*-13-octadecadienoates). With α -eleostearate (*cis,trans,trans*-9,11,13-octadecatrienoate), stereoselective 1,4-reduction of the *trans,trans*-diene portion yielded linoleate (*cis,cis*-9,12-octadecadienoate). However, *cis,trans*-1,4-dienes were also formed from the apparent isomerization of α - to β -eleostearate. Hydrogenation of methyl linolenate (methyl *cis,cis,cis*-9,12,15-octadecatrienoate) produced a mixture of isomeric dienes and monoenes attributed to conjugation occurring as an intermediate step. The hydrogenation of α -eleostearin in tung oil was more stereoselective in forming the *cis,cis*-diene than the corresponding methyl ester. Hydrogenation of linseed oil yielded a mixture of dienes and monoenes containing 7% *trans* unsaturation. We have suggested how the mechanism of stereoselective hydrogenation with $\text{Cr}(\text{CO})_3$ catalysts can be applied to the problem of selective hydrogenation of linolenate in soybean oil.

3072 • Methyl 9(10)-Carboxystearate by Catalytic Oxidation of Hydroformylated Oleate

A. W. Schwab, E. N. Frankel, E. J. Dufek, and J. C. Cowan

J. Amer. Oil Chem. Soc. 49(1): 75-79. January 1972

Methyl 9(10)-formylstearate from hydroformylated oleate is autoxidized effectively to the corresponding carboxystearate in the presence of metal naphthenates at 20° C. Up to 95% conversion is obtained by treatment with Ca naphthenate for 24 hours. Catalyst activity based on disappearance of formylstearate approximates the following order: $\text{Co} > \text{Pb} > \text{Mn} > \text{Ce} > \text{Fe} > \text{Zr} > \text{Ca}$.

Decreasing yields of carboxyester obtained with different catalysts follow the approximate order: $\text{Ca} > \text{Pb} \approx \text{Fe} \approx \text{Zr} \approx \text{Mn} > \text{Co} > \text{Ce}$. The active redox metal catalysts such as Co, Ce, and Mn produce varying amounts of methyl stearate, epoxy-, keto-, and hydroxystearate as side products. Ca naphthenate minimizes free radical decarbonylation and other side reactions. Mechanisms are proposed for the formation of side products.

3073 • Selective Hydrogenation of Soybean Oil. VI. Copper-on-Silica Gel Catalysts

Sambasivarao Koritala

J. Amer. Oil Chem. Soc. 49(1): 83-84. January 1972

The preparation of copper-on-silica gel catalysts containing 15% and 20% copper is described. These catalysts can be reused three times without appreciable loss of activity. Their activity compares favorably with the highly active 5% copper-on-silica gel catalyst previously reported. Higher copper catalysts are somewhat less selective for the reduction of linolenate in soybean oil than 5% copper-on-silica gel, but these copper catalysts have greater activity, better reuse characteristics, and selectivity comparable to commercial copper-chromite catalysts.

3074 • Preliminary Processing Studies Reveal Triticale Properties

R. A. Anderson, A. C. Stringfellow, and E. L. Griffen, Jr.

Northwest. Miller 279(2): 10-13. February 1972

A new grain crop, triticale, is making its appearance in several wheat-growing states. Triticale is a wheat-like cereal grain that is man-made by selectively crossing wheat and rye. Dry and wet milling studies carried out on triticale show that it can be milled to a straight grade flour of somewhat low yield compared with wheat but with a protein content in the range of most hard wheat flours. Further grinding and air classification gave a good yield (25%) of a combined high-protein fraction; protein content of this fraction was 29%. The combined starchy fraction from dry classification amounted to about 65%, and the amount of coarse residue was quite low compared to the same fraction from wheat and rye. Conventional wet milling of triticale showed that this grain responds much like soft wheats. A good starch product with a low-protein content (0.27%) is obtained. Triticale flour can be wet fractionated with some difficulty. The softer character of its gluten necessitates more care during the washing steps.

- 3075 • Compounds of Brownd Flavor Derived from Sugar-Amine Reactions
J. E. Hodge, F. D. Mills, and B. E. Fisher
Cereal Sci. Today 17(2): 34-38, 40. February 1972

Several pure compounds that give characteristic brownd flavors have been isolated from foods and model systems over the past 5 years. The caramel, nutty, and burnt aromas of these pure compounds correlate with their molecular structures and shapes. The formation of characteristic brownd flavor compounds in sugar-amine reactions involves the Amadori rearrangement. For cereals, the thermal decomposition of 1-deoxy-1-proline-D-fructose is particularly important. Brownd flavor compounds arise from the ketose sugar moiety by amine elimination from C-1 after 2,3-enolization of the Amadori compound. They arise from the proline moiety by the Strecker degradation, which is initiated by α -dicarbonyl compounds derived from the sugar. Aliphatic aldehydes and α -dicarbonyl compounds, furaldehydes, and pyrrole aldehydes contribute to brownd aromas, but alkyl- and acyl-substituted oxygen and nitrogen heterocyclics provide aromas more characteristic of roasted cereals.

- 3076 • Effects of Southern Corn Leaf Blight on Products of Wet Milling
R. A. Anderson, J. J. Ellis, and E. L. Griffin, Jr.
Cereal Sci. Today 17(2): 41-42, 44, 53. February 1972

High incidence of southern corn leaf blight through much of the Corn Belt in 1970 caused considerable concern, not only among growers but also within industries using large quantities of corn. Annually, more than 200 million bushels of corn are wet-milled to produce starch, oil, and byproducts. Experimental wet milling of blight-infected corn did not cause any processing problems. The amount of kernel swelling during steeping increased, and, as moldy kernel count increased, so did the steeped corn moisture. Also, germ separation appeared more difficult as blight damage to the corn became more severe. Yields of starch and oil varied from corn sample to corn sample, with the lowest yields from the most heavily infected corn. Quality of the starch and oil appeared to remain good regardless of the extent of blight damage. The various wet-milled products contained no *Helminthosporium maydis*, the fungus that causes the disease.

- 3077 • α -Cellobiose and α -Isomaltose from Crystalline Complexes with Sodium Iodide
J. A. Rendleman, Jr.
Carbohyd. Res. 21(2): 235-247. February 1972

The crystalline complexes $2\text{NaI} \cdot \alpha$ -cellobiose, $\text{NaI} \cdot \alpha$ -cellobiose $\cdot 2\text{H}_2\text{O}$, $\text{NaI} \cdot \alpha$ -isomaltose, and $\text{NaBr} \cdot \alpha$ -isomaltose have been isolated. Sodium iodide adducts were used to prepare crystalline α -cellobiose (98% α) and amorphous α -isomaltose (90% α), previously inaccessible anomeric forms. The disaccharides and their complexes were analyzed for anomeric content by gas-liquid chromatography, and characterized by polarimetry and nuclear magnetic resonance and infrared spectroscopy. The strong influence of sodium iodide on the optical rotation of a number of carbohydrates suggests that complexation with sodium iodide can affect molecular conformation.

- 3078 • Hydrolyses of Intermediate Acetoxonium Ions Derived from D-Glucose
W. E. Dick, Jr.
Carbohyd. Res. 21(2): 255-268. February 1972

The effects of solution acidity and structural differences on the relative proportions of 1-OH and 2-OH forms produced by hydrolysis were determined for tetra-*O*-acetyl- β -D-glucopyranosyl chloride, 2,3-di-*O*-acetyl-4,6-*O*-ethylidene- β -D-glucopyranosyl chloride, and hepta-*O*-acetyl- β -maltosyl chloride, tri-*O*-acetyl-1,2-*O*-(ethoxy-ethylidene)- α -D-glucopyranose, and hexa-*O*-acetyl-1,2-*O*-(methoxy-ethylidene)- α -maltose. Formation of a 2-OH derivative was promoted in strongly acidic solutions; however, the extent to which a given reactant formed a 2-OH product also was determined by structural features at sites remote from the reaction center. Control of solution acidity led to yields of the 2-OH form varying from 10 to 75% in series 1, from 51 to 95% in series 2, and from 9 to 40% in series 3. To demonstrate the usefulness of such product mixtures in syntheses of 2-*O*-substituted derivatives, 2-methyl esters were prepared from 1,3-di-*O*-acetyl-4,6-*O*-ethylidene- α -D-glucose and 1,3,6,2',3',4',6'-hepta-*O*-acetyl- α -maltose. Nuclear magnetic resonance spectral data were obtained.

3079 • Continuous Fermentation to Produce Xanthan Biopolymer:
Effect of Dilution Rate

R. W. Silman and P. Rogovin

Biotechnol. Bioeng. 14(1): 23-31. January 1972

Single-stage continuous fermentations to produce xanthan gum have been run at dilution rates (D) from 0.023 to 0.196 hour⁻¹. Xanthan production rate (XPR) was a function of D . XPR increased from 0.34 g./hr./kg. at $D = 0.023$ hour⁻¹ to the maximum 0.84 g./hr./kg. at $D = \text{ca. } 0.15$ hour⁻¹. At $D > 0.15$ hour⁻¹ XPR decreased and at the highest D studied (0.196 hour⁻¹) was 0.69 g./hr./kg. Yield of xanthan from glucose consumed was 81-89%. Steady states ended between 6.5 and 8.7 turnovers when a variant strain occurred.

3080 • Haemolymph Lipids of Healthy and Diseased Japanese Beetle Larvae

Glenn A. Bennett and Odette L. Shotwell

J. Insect Physiol. 18(1): 53-62. January 1972

Extractable lipids from the haemolymph of healthy and diseased larvae of the Japanese beetle, *Popillia japonica*, have been characterized and compared. Total lipid content of normal larvae was 5.7 to 7.2 mg./ml. haemolymph. This value was reduced to 3.1 to 3.9 mg./ml. in haemolymph from larvae infected with the milky disease organism, *Bacillus popilliae*. Neutral lipids accounted for 70% of total lipids in both normal and diseased larvae haemolymph. Phospholipids accounted for 30% of the total lipids. The neutral lipid fraction is composed of sterols, monoglycerides, free fatty acids, 1,2- and 1,3-diglycerides, triglycerides, sterol esters, and hydrocarbons. Haemolymph phospholipids are composed primarily of phosphatidic acid, phosphatidyl choline, and phosphatidyl ethanolamine. The fatty acid composition of both neutral lipid and phospholipid fractions is predominately C₁₆ and C₁₈ fatty acids. Significant quantities of hydrocarbons have been detected in the neutral lipids of haemolymph from both healthy and diseased larvae. Infection with *B. popilliae* resulted in a non-selective decrease of 45% in neutral lipids and phospholipids in haemolymph from third instar larvae.

3081 • New Mycotoxin, Trichotoxin A, from *Trichoderma viride*
Isolated from Southern Leaf Blight-Infected Corn

C. T. Hou, A. Ciegler, and C. W. Hesseltine

Appl. Microbiol. 23(1): 183-185. January 1972

In a solvent extract of the mycelium of *Trichoderma viride* isolated from corn infected with southern leaf blight, a new mycotoxin, trichotoxin A, was found. Trichotoxin A is a cyclic peptide with the following amino acid composition: (gluN)₂, (glu)₁, (pro)₂, (gly)₁, (ala)₃, (leu)₃, (2-methyl alanine)₁.

3082 • Dye-Sensitized Photooxidation of α -Tocopherol

G. W. Grams, K. Eskins, and G. E. Inglett

J. Amer. Chem. Soc. 94(3): 866-868. February 1972

The photooxidation of α -tocopherol with visible light requires the presence of a dye sensitizer (proflavin). α -Tocopherol photooxidized smoothly in methanol to isomers of 4a,5-epoxy-8a-methoxy- α -tocopherone (34%), 8a-methoxy- α -tocopherone (14%), α -tocoquinone 2,3-oxide (6%), and α -tocoquinone (<1%). Two geometric isomers of 4a,5-epoxy-8a-methoxy- α -tocopherone were isolated and characterized and a possible mechanism involving singlet oxygen is proposed.

3083 • Dye-Sensitized Photooxidation of Tocopherols. Correlation Between Singlet Oxygen Reactivity and Vitamin E Activity

G. W. Grams and K. Eskins

Biochemistry 11(4): 606-608. February 1972

The singlet oxygen reactivity of α -, β -, γ -, and δ -tocopherol was determined in methanol with methylene blue as the photosensitizer. The disappearance of tocopherol was followed colorimetrically according to the Emmerie-Engel method. Of the four tocopherols, α was the most reactive ($\beta = 1.4 \times 10^{-4}$ M) and δ was the least ($\beta = 13.5 \times 10^{-4}$ M). α -Tocopherol is one of the most reactive compounds toward singlet oxygen reported in the literature. The reactivity of each tocopherol (α , β , γ , and $\delta = 1$, 0.50, 0.26, and 0.10) correlates well with its vitamin E activity.

3084 • Allyl Glucosides--Preparation and Chromatographic Separation of Anomeric Mixture

Felix H. Otey, Richard P. Westhoff, and Charles L. Mehlretter

Ind. Eng. Chem. Prod. Res. Develop. 11(1): 70-73. March 1972

A mixture of allyl glucosides was prepared by the acid-catalyzed reaction of allyl alcohol and α -D-glucose. Pure allyl α - and β -D-glucopyranosides were separated from the mixture on a basic ion-exchange column. The resin was converted to the OH^- form by a time-saving off-the-column technique that avoided contaminating the resin with CO_2 . The desorption process was followed by gas-liquid chromatography (GLC), phenol- H_2SO_4 assay, and optical rotation. Various physical properties, including nuclear magnetic resonance, were determined for the isolated anomers. GLC methods were developed for quantitating the anomers in the final product and at intervals during the reaction. After 2 hours at 90 - 92°C ., 70-80% of the starting glucose was converted to allyl α - and β -D-glucopyranosides; 20-30% was probably converted to allyl glucosides of di- and oligosaccharides by reversion. The acid catalyst and trace amounts of free glucose were easily removed by filtering the reaction mixture through a small bed of ion-exchange resin. Concentration of the neutral solution yielded a mixture of glucosides with potential for the synthesis of new polymers.

3085 • Reductive Ozonolysis for Monoenoic Fatty Acid Structure Determination in the Microreactor Apparatus

A. E. Johnston and H. J. Dutton

J. Amer. Oil Chem. Soc. 49(2): 98-100. February 1972

An improved method of double bond location in unsaturated monoenoic fatty acids has been developed for the "integrated microreactor apparatus" (MRA) system. Solid triphenylphosphine (TPP), as contrasted with previously employed TPP solutions, effectively reduces ozonides to aldehydes and eliminates interferences of solvents with desired aldehyde peaks and the selective loss of volatile aldehydes. The need for separating homologous series of volatile aldehydes at subambient temperatures (beginning at -40°C.) and of long chain aldehyde esters (up to 270°C.) places stringent requirements upon column stability, polarity, and resolution. An effective substrate system for gas-liquid chromatography (GLC) has been developed that gives results amenable to digital computer analysis; also developed are techniques of utilizing temperature measurements from temperature programming and for eliminating detector poisoning by TPP. This improved MRA system has been applied to the analysis of isomeric fatty acids formed in hydrogenation of fats.

3086 • Headspace Gas Analysis of Salad Oils by Mass Spectrometry

C. D. Evans and E. Selke

J. Amer. Oil Chem. Soc. 49(2): 106-110. February 1972

A mass spectrometer was used to analyze the content of hydrogen, nitrogen, oxygen, carbon dioxide, and argon in headspace gas of commercially packaged soybean, cottonseed, and corn salad oils. A leakproof sampling system was designed to avoid air contamination and obtain a representative headspace gas sample. Some edible oils are packaged under pure nitrogen, whereas other samples contained various amounts of oxygen in the headspace gas. The presence or absence of argon in the headspace gas indicates that some oils are packaged with pure nitrogen and others with nitrogen obtained by controlled burning of hydrocarbons to remove all the oxygen in air. The presence of hydrogen in some samples where argon was also present suggested that catalytic purifiers were used to remove the last traces of oxygen and to ensure pure nitrogen for packaging oils. The decrease in oxygen of oils bottled in air was followed during storage at room and at elevated temperatures.

3087 • Differential Scanning Calorimetry of Single Acid Triglycerides: Effect of Chain Length and Unsaturation

J. W. Hagemann, W. H. Tallent, and K. E. Kolb¹

(¹Bradley University, Peoria, Ill.)

J. Amer. Oil Chem. Soc. 49(2): 118-123. February 1972

The polymorphism of 13 single acid triglycerides with acyl group chain lengths ranging from 16 to 22 was studied by differential scanning calorimetry. In contrast to the single β' -form generally attributed to such triglycerides, at least two intermediate endotherms were found for most samples between the least stable (α) and most stable (β) polymorphs. For saturated triglycerides, two versions of the familiar "tuning fork" model meet the β' -form requirement of alternate fatty acid chains in planes perpendicular to each other. The detection of three intermediate endotherms for triolein, tri-*cis*-11-octadecenoin and tri-erucin (and possibly also trilinolein) may be rationalized by assuming that the segments of polymethylene chains on either side of double bonds may zigzag in different planes. Four exceptions for which no evidence was found for β' -forms are tri-*cis*-6-octadecenoin, tri-*cis*-6-hexadecenoin, tri-*trans*-6-octadecenoin, and trielaidin. Three of these exceptions contain Δ^6 -acyl groups and have in common segments with even numbers of methylene groups on either side of the double bonds. These same three triglycerides also have a shorter than usual polymethylene segment between the ester linkages and the double bonds and a longer than usual distance from the double bonds to the terminal methyl groups. Tri-*trans*-6-octadecenoin and trielaidin are exceptional in still another way. Only they and trierucin exhibited significant nonconformity with an empirical relationship between melting points and heats of fusion of β -forms. Otherwise, all points in a plot of the former physical constants vs. the latter closely fit a smooth curve, the positive slope of which gets larger as the X-axis values, i.e., melting points, increase.

3088 • Homogeneous Hydrogenation of Methyl *cis*-9,*cis*-15-Octadecadienoate Catalyzed by Platinum-Tin, Palladium and Nickel Complexes

E. N. Frankel, Hiroshi Itatani,¹ and John C. Bailar, Jr.¹

(¹University of Illinois, Urbana)

J. Amer. Oil Chem. Soc. 49(2): 132-133. February 1972

Methyl *cis*-9,*cis*-15-octadecadienoate was used as a model for the hydrogenation of methyl linolenate. Homogeneous catalysis by platinum, palladium, and nickel complexes produced a mixture of isomeric monoenes similar to that from the hydrogenation of methyl linolenate. These catalysts are, therefore, capable of promoting isomerization of isolated double bonds and of producing conjugated dienes which are necessary for the formation of monoenes.

- 3089 • New Polyacetal, Poly(ester-acetal) and Their Urethane-Modified Coatings from Hydroformylated Linseed Oil
T. H. Khoe, L. E. Gast, E. N. Frankel, and J. C. Cowan
J. Amer. Oil Chem. Soc. 49(2): 134-136. February 1972

Partly hydroformylated linseed oil, with an average of 1.3 to 3.4 meq aldehyde per gram of oil, was reacted with pentaerythritol hydroxymethyl linseed oil and trimethylolpropane in the presence of an acid catalyst to form viscous, high-molecular-weight polyacetals. Isophthalic acid or chlorendic anhydride-modified polyacetals [poly(ester-acetals)] were prepared by reacting the trimethylolpropane esters of the acids with the hydroformylated oils. Films of the products were cured at room temperature and at 140° C. These films showed good hardness as well as chemical and impact resistance. Further modification of these polyacetals and poly(ester-acetals) by reacting the residual hydroxyl groups with an excess of toluene diisocyanate gave the corresponding isocyanate-terminated prepolymers. Films from these prepolymers had shorter drying times and showed greater hardness than the corresponding unmodified materials.

- 3090 • Extracellular Black Yeast Polysaccharide Composed of *N*-Acetyl Glucosamine and *N*-Acetyl Glucosaminuronic Acid
Allene Jeanes, Kermit A. Burton, Martin C. Cadmus,
Clarence A. Knutson, Gerald L. Rowin, and Paul A. Sandford
Nature New Biol. 233(43): 259-260. October 1971

Preliminary information is reported on the preparation and composition of a polysaccharide that is unique among those now known, not only from yeasts but also from all other microorganisms. Few polysaccharides containing *N*-acetyl glucosaminuronic acid have been known heretofore. Unlike the product from the unidentified black yeast NRRL Y-6272, none of these are extracellular and most are from pathogens. Techniques of classical carbohydrate and organic chemistry and of radiochromatography have been employed to establish that this new polysaccharide is composed of *N*-acetyl glucosamine and *N*-acetyl glucosaminuronic acid in the molar ratio of approximately 2:1.

- 3091 • A Toxic Substance from *Aspergillus viridi-nutans*
E. B. Lillehoj and A. Ciegler
Can. J. Microbiol. 18(2): 193-197. February 1972

A compound toxic to mice has been extracted from mycelia of *Aspergillus viridi-nutans* NRRL 4365, a member of the *A. fumigatus* group. After 2 weeks of growth on a Raulin-Thom medium in static culture at 28° C., up to 2 grams of toxin could be recovered from 300 grams (wet weight) of mycelium. After the compound was isolated by chromatographic separation on activated magnesium silicate columns, the purified fraction was readily crystallized from cold benzene. A suspension of the substance in propylene glycol

(administered intraperitoneally) had an LD₅₀ of 2.8 mg./kg. in 20-gram mice. The toxin was highly fluorescent, exhibiting a 382-nm. excitation band and an emission maximum at 450 nm. In thin-layer chromatographic analyses the crystalline compound appeared as a single fluorescent spot in two different solvent systems. The ultraviolet spectrum of the metabolite showed absorption maxima at 380 and 266 nm. Distinctive features of the infrared spectrum were the presence of chelated hydroxyl groups and a carbonyl ester function. Mass spectrometry demonstrated that the toxin had a molecular weight of 662 and a molecular formula of C₃₄H₃₀O₁₄. Chemical microanalysis verified the formula and provided evidence of four methoxyl groups.

3092 • Emulsion Technology

L. H. Princen

In "Treatise on Coatings," eds. R. R. Myers and J. S. Long, vol. 1, pt. 3, chap. 2, pp. 77-128. 1972

In describing the physical chemistry and technology of emulsions, the concepts of oil/water, water/oil, and multiple emulsions, of emulsifying agents and emulsion stabilization, and of emulsion preparation are first introduced. Then various emulsification processes for small, intermediate, and large quantities by direct oil-in-water and by inversion techniques are detailed. Tests for such properties as emulsion type, stability, viscosity, surface tension, electrophoretic mobility, and particle-size distribution are outlined. A resume is included of all the published work of the Northern Division on emulsion research by its linseed oil emulsion paint group.

3093 • Publications and Patents of the Northern Marketing and Nutrition Research Division, July-December 1971

North. Market. Nutr. Res. Div.

U.S. Agr. Res. Serv., Unnumb. Pub., 65 pp. [February 1972]

3094 • Biopolymers of Activated Sludge

Lowell L. Wallen and Edwin N. Davis

Environ. Sci. Technol. 6(2): 161-164. February 1972

Activated sludge from the municipal sewage treatment plant at Peoria, Illinois, was extracted with hot water and organic solvents. Heteropolysaccharides and a polyester were obtained by water and chloroform extraction, respectively. Bacterial strains have been isolated from activated sludge. Some of these bacteria produced polysaccharides when grown on 0.5% glycerol or glucose. An acquired strain of *Zoogloea ramigera* produced a heteropolysaccharide from glucose. Photomicrographs of extracted and unextracted activated sludge indicate that polymeric material is removed by extraction with hot water.

3095 • A New Type of Basic Amide Hydrolysis, Characterized by Alkyl-Nitrogen Fission

Frank H. Stodola

J. Org. Chem. 37(2): 178-186. February 1972

Amides of the type $\text{RNHCH(R}^1\text{)C}_6\text{H}_4\text{N=NR}^2$ [R = alkyl C=O , aryl C=O , alkyl SO_2 , aryl SO_2 , $\text{H}_2\text{NC=O}$, $\text{C}_6\text{H}_5\text{NHC=O}$, $(\text{C}_6\text{H}_5)_2\text{NC=O}$; R^1 = H, CH_3 , C_6H_5 ; R^2 = phenyl, substituted phenyl, naphthyl] undergo basic hydrolysis under mild conditions to give RNH_2 and $\text{R}^1\text{C(=O)C}_6\text{H}_4\text{NHNHR}^2$. A similar reaction occurs when the substituents are *ortho* to one another. No reaction takes place when the groups are in the *meta* position. The effects of structural modifications on the course of the reaction were studied, and a mechanism for the reaction has been proposed.

3096 • Physical Chemical Characterization of Grain Sorghum Prolamine Fractions and Components

Alfred C. Beckwith and Richard W. Jones

J. Agr. Food Chem. 20(2): 259-261. March-April 1972

The prolamines of grain sorghum have the unique property of forming gels at low protein concentrations in a variety of solvents. Differences in the solubility properties and amino acid composition of prolamine fractions are described, and evidence is presented to show that protein from sorghum prolamines undergoes noncovalent interaction even in such solvents as 6 *M* guanidine hydrochloride.

3097 • Mechanism of Hydrogen Transfer Reactions in 1,4-Cyclohexadiene and 1,4-Hexadiene Catalyzed by Tricarbonyl Chromium Complexes

E. N. Frankel

J. Catal. 24(2): 358-360. February 1972

Isomerization of 1,4-cyclohexadiene and 1,4-hexadiene with methyl benzoate- Cr(CO)_3 was studied to elucidate the mechanism of catalytic homogeneous hydrogenation. Isomerization of cyclohexadiene is accompanied by disproportionation. *trans*-1,4-Hexadiene is much more reactive than *cis*-1,4-hexadiene in yielding *cis*-2,*trans*-4-hexadiene. The results support a mechanism involving pentadienyl hydride- and diene- Cr(CO)_3 complexes as key intermediates in the isomerization and disproportionation reactions.

3098 • Antibacterial Activity Produced by Molds Commonly
Used in Oriental Food Fermentations

Hwa L. Wang, J. J. Ellis, and C. W. Hesseltine
Mycologia 64(1): 218-221. January-February 1972

Cultures of *Actinomucor elegans*, *Rhizopus chinensis*, *R. oryzae*, *R. javanicus*, and *R. chlamydosporus* isolated from Oriental fermented products produce antibacterial compounds that are active against Gram-positive bacteria. Their ability to synthesize those compounds, however, varies markedly with the nature of the growth media. These biochemical functions may be a valuable criterion for supplementing morphological characters in taxonomy of fungi.

3099 • Proflavin-Sensitized Photooxidation of 3-Methyl Indole
to 2-Methyl-2-methoxy-1,4-benzoxazine

K. Eskins
Photochem. Photobiol. 15(3): 247-252. March 1972

The dye-sensitized photochemical oxidation of 3-methyl indole was studied as a model for the photooxidation of the indole amino acid, tryptophan. The major product formed by proflavin-sensitized photooxidation is 2-methyl-2-methoxy-1,4-benzoxazine. The compound was isolated by preparative gas chromatography and identified by a combination of nuclear magnetic resonance, ultraviolet, infrared, and mass spectroscopy on the photoproduct and its derivatives.

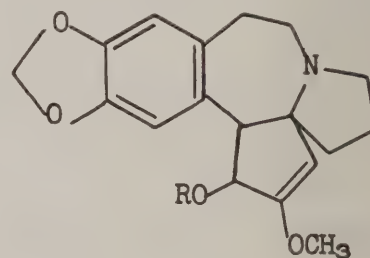
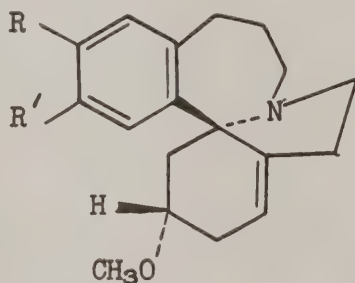
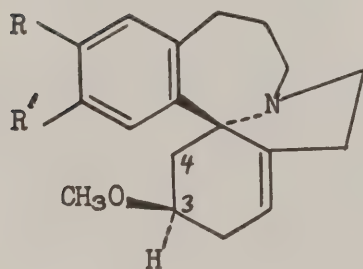
3100* • Germination and Outgrowth of Single Spores of
Saccharomyces cerevisiae Viewed by Scanning
Electron and Phase-Contrast Microscopy

Paul Rousseau,¹ Harlyn O. Halvorson,¹ Lee A. Bulla, Jr.,
and Grant St. Julian
(¹University of Wisconsin, Madison)
J. Bacteriol. 109(3): 1232-1238. March 1972

Development of a vegetative cell from a spore follows a definite sequence of events involving dramatic physical and chemical modifications. These changes are: initial rapid loss in cellular absorbance followed later by an abrupt gain in absorbance; reduction in cell weight and a subsequent progressive increase; modification of the spore surface with concomitant diminution in refractility; elongation of the cell and augmentation of surface irregularities; rapid decline in trehalose content of the cell accompanied by extensive formation of trichloroacetic acid-insoluble carbohydrates, bud formation, and synthesis of protein.

3101 • Structures of Homoerythrina Alkaloids from
Cephalotaxus harringtonia
 R. G. Powell
 Phytochemistry 11(4): 1467-1472. April 1972

The structures of five minor alkaloids from *Cephalotaxus harringtonia* K. Koch var. *harringtonia* have been determined. These alkaloids are simple derivatives of schelhammericine (I). In alkaloid II, the methylenedioxy group of I is replaced by one hydroxyl group and one methoxyl group; alkaloid III is the analogous dimethoxy derivative. Alkaloids IV, V, and VI are the corresponding C-3 epimers of alkaloids I, II, and III. Though schelhammericine itself has not yet been observed in *Cephalotaxus*, alkaloids IV and V are identical in all respects with two alkaloids found in *Schelhammera pedunculata*. Alkaloids II, III, and VI are previously unreported in the literature. The co-occurrence of these minor homoerythrina-type alkaloids (II-VI) with the major *Cephalotaxus* alkaloid cephalotaxine (VII) and its antileukemic ester (VIII-XI) is of interest biogenetically.



- | | | |
|---|---------------------------------------|--|
| I. $R + R' = \text{OCH}_2\text{O}$ | IV. $R + R' = \text{OCH}_2\text{O}$ | VII. $R = \text{H}$ |
| II. $R + R' = \text{OCH}_3 + \text{OH}$ | V. $R + \text{OCH}_3; R' = \text{OH}$ | VIII. $R = \text{C}_{10}\text{H}_{17}\text{O}_5$ |
| III. $R = R' = \text{OCH}_3$ | VI. $R = R' = \text{OCH}_3$ | IX. $R = \text{C}_{10}\text{H}_{17}\text{O}_5$ |
| | | X. $R = \text{C}_{11}\text{H}_{19}\text{O}_5$ |
| | | XI. $R = \text{C}_{10}\text{H}_{17}\text{O}_4$ |

- 3102* • Heat Transfer in Fluidized Beds of Flour and Starch
 Abolhassan Nazemi,¹ E. B. Lancaster, and T. D. Wheelock¹
 (¹Iowa State University, Ames)
 Chem. Eng. Progr. Symp. Ser. 67(116): 106-113. 1971

The rate of heat transfer was measured between beds of flour or starch, fluidized with different gases and gas velocities, and the wall of a confining column 6 inches in diameter. Since these solids are cohesive, it was necessary either to stir the beds with a slowly revolving paddle located just above the gas distributor, or add an antiagglomerant to prevent channeling. The rate of heat transfer depended on the nature of the solids, the properties of the gas, and the gas velocity, but not on stirring speed. The smallest rates of heat transfer were obtained with cornstarch. For gas velocities between the minimum fluidizing velocity and twice that value, the rate of heat transfer tended to increase as the velocity was increased. Noticeably greater rates of heat transfer were observed when the solids were fluidized with hydrogen than when they were fluidized with either nitrogen or carbon dioxide.

- 3103 • Hydroperoxides from Oxidation of Linoleic and Linolenic Acids by Soybean Lipoxygenase: Proof of the *trans*-11 Double Bond
 H. W. Gardner and D. Weisleder
 Lipids 7(3): 191-193. March 1972

Hydroperoxides produced by oxidation of linoleic and linolenic acids with soybean lipoxygenase were analyzed by nuclear magnetic resonance. The isomerized double bond α,β to the hydroperoxide group at carbon-13 was determined to be *trans*. The complete structures of the major products proved to be 13-hydroperoxy-*cis*-9,*trans*-11,*cis*-15-octadecatrienoic acid from linolenic acid. The configuration of the double bonds indicates that oxidation took place through a free radical mechanism as proposed previously by others.

- 3104 • Stereospecific Analysis of Triglycerides from
Monnina emarginata Seed Oil
 B. E. Phillips and C. R. Smith, Jr.
 Lipids 7(3): 215-217. March 1972

In *Monnina emarginata* seed oil triglycerides, more than two-thirds of the *S*-coriolic (13L-hydroxy-*cis*-9,*trans*-11-octadecadienoic) acid occurs in position 3 (relative to *sn*-glycerol). All but a trace of the remainder is in position 1.

3105 • *Pichia besseyi* sp. n.

C. P. Kurtzman and L. J. Wickerham

Antonie van Leeuwenhoek J. Microbiol. Serol. 38(1):
49-52. 1972

A new species of *Pichia* is described, *Pichia besseyi*, that was isolated from a marsh near the town of Bonaventure, Gaspé Peninsula, Quebec, Canada. The hemispheroidal shape of the ascospores of this species is particularly noteworthy.

3106 • New Linseed Oil-Derived Polymers and Some Potential Uses

T. H. Khoe, F. H. Otey, L. E. Gast, and J. C. Cowan

Proc. 41st Annu. Flax Inst. of the U.S., Fargo, N. Dak.,
November 11-12, 1971, pp. 4-5. 1972

Polyhemiacetals and polyacetals were prepared by reacting formyl linseed oil with hydroxypolymers from petroleum. Air-dried and baked films from these polymers were generally harder and more resistant to alkali than unmodified linseed oil films. Polyols prepared from formyl linseed oil and its derivatives or mixtures of these polyols and a commercial polyalcohol were treated with polymethylene polyphenylisocyanate and a foaming agent to produce rigid urethane foams. Foams prepared from the mixed polyols were comparable to a typical foam from castor oil.

3107 • Linseed Oil Emulsions for Curing Concrete: Laboratory and Field Tests

J. C. Cowan, W. L. Kubie, and L. E. Gast

Proc. 41st Annu. Flax Inst. of the U.S., Fargo, N. Dak.,
November 11-12, 1971, pp. 7-10. 1972

Both laboratory and field tests show that linseed oil emulsions applied to new concrete as a curing agent may also serve as an antiscaling agent for the first 1 or 2 years. Several states are using linseed emulsions for curing bridge decks. Private contractors have used, or will be using, this technique on a number of construction projects.

3108 • Dimers of Isoeugenol by Dye-Sensitized Photooxidation

K. Eskins, C. Glass, W. Rohwedder, R. Kleiman, and J. Sloneker
Tetrahedron Lett. (9): 861-864. February 1972

The dye-sensitized photooxidation of isoeugenol in methanol gives three principal products--dehydro diisoeugenol and two isomeric β -aryl ether dimers of isoeugenol. Evidence is given for the structures assigned, and a possible role for photooxidation in lignin synthesis is considered.

- 3109 • Studies of the Toxicity of *Helminthosporium maydis*
 A. Ciegler, J. L. Richard,¹ J. J. Ellis, and S. J. Cysewski¹
 (¹National Animal Disease Laboratory, Ames, Iowa)
 Appl. Microbiol. 23(3): 586-591. March 1972

Isolates of *Helminthosporium maydis* from blighted corn were tested for toxicity in mice, rats, swine, rabbits, microorganisms, and tissue culture. Extracts of grains, mycelia, and culture supernatant fluids killed mice on intraperitoneal (IP) injection, but were nontoxic on administration by mouth to swine. The toxin was partially purified and appears to be a glycopospholipid. Histopathological examination revealed that the toxin acted as a severe irritant on IP injection, causing death in laboratory animals. In skin tests with rabbits, considerable exudation occurred, rather than necrosis.

- 3110 • Factors Influencing L-Asparaginase Production by
Erwinia aroideae
 R. E. Peterson and A. Ciegler
 Appl. Microbiol. 23(3): 671-673. March 1972

L-Asparaginase production by *Erwinia aroideae* NRRL B-138 in shaken flasks can be markedly increased if high quantities of yeast extract are added to the growth medium. Enzyme production is directly proportional to concentrations of yeast extract between 0.25 and 1.0%. At higher levels, aeration must be increased to achieve yields of 6.6 international units per milliliter. Although almost all the alternative products examined as possible substrates for *E. aroideae* supported growth, enzyme production was diminished considerably. Mixtures of yeast extract with these other products indicated that certain unknown nutrients were lacking rather than that inhibitors were present.

- 3111 • Preparation of Insoluble Papain through Cyanoethylated
 Starch Anthranilates
 C. L. Mehltrittter and F. B. Weakley
 Biotechnol. Bioeng. 14(2): 281-283. March 1972

Active water-insoluble papain derivatives were prepared by coupling papain to various diazotized starch anthranilates and cyanoethyl starch anthranilates (CESA). Gelatinization of the starch esters in water at 95° before diazotizing and coupling provided more highly active enzyme preparations. However, gelatinization also led to undesirable loss of bound papain and excessive water retention by the insoluble enzyme during recycling. The most practical water-insoluble papain derivatives were prepared from CESA having high cyanoethyl and low anthranilate substitutions. Several of the papain derivatives maintained relatively constant protease activity through numerous use and regeneration cycles in the hydrolysis of casein and during at least 1 month's storage at 10°.

- 3112 • Mineral Constituents in Corn and Wheat Germ
by Atomic Absorption Spectroscopy
W. J. Garcia, C. W. Blessin, and G. E. Inglett
Cereal Chem. 49(2): 158-167. March-April 1972

A rapid wet-ashing procedure, coupled with atomic-absorption techniques, provided a fast method of mineral analysis in corn and wheat-germ samples, with no chemical separations being involved. Samples (0.3 or 2.0 g.) were decomposed by wet-ashing to yield a clear solution. From this solution, potassium, magnesium, calcium, sodium, iron, copper, manganese, and zinc were determined by atomic-absorption techniques. Phosphorus was measured colorimetrically. Interference effects were evaluated in analyzing zinc in an ashed wheat-germ solution. The method has been applied to the analysis of various corn and wheat-germ samples, and results compare favorably with other methods.

- 3113 • Total Carbohydrate Determination in Dimethyl Sulfoxide
and Guanidine Hydrochloride as Solvents
Frederick R. Dintzis
Anal. Biochem. 46(1): 108-113. March 1972

Total carbohydrate determination by the phenol-sulfuric acid colorimetric method has been adapted for use with dimethyl sulfoxide and 4 M guanidine hydrochloride as solvents in an AutoAnalyzer system. Analytical conditions may be adjusted to obtain linear functions of optical density versus concentration up to 100 $\mu\text{g./ml.}$ of carbohydrate and at concentration gradients of 10 $\mu\text{g./ml.}$

- 3114 • Acetal Derivatives of Methyl 9(10)-Formylstearate:
Plasticizers for PVC
R. A. Awl, E. N. Frankel, E. H. Pryde, and J. C. Cowan
J. Amer. Oil Chem. Soc. 49(4): 222-228. April 1972

Several acetals and an enol ether were prepared from methyl 9(10)-formylstearate and characterized with respect to their thermal, spectroscopic, and chromatographic properties. These low-melting (below -80°C.) compounds were generally compatible as secondary poly(vinyl chloride) plasticizers and imparted low-temperature properties that were intermediate between those obtained with dioctyl phthalate and dioctyl sebacate.

- 3115 • Sporulation of *Bacillus popilliae* in Liquid Medium as Affected by Kind of Carbon and Method of Sterilization
William C. Haynes, Lenora J. Weih, and Clarence Crowell
Can. J. Microbiol. 18(4): 515-518. April 1972

Of six activated carbons from two manufacturers, four made from nutshells evoked sporulation by *Bacillus popilliae* NRRL B-2309S in a tryptone-glucose-yeast extract-phosphate medium. Four to nine million refractile spores per milliliter were produced in cultures containing a selected carbon that was sterilized apart from the base medium. A reduction in yield of spores that resulted from sterilizing glucose in the medium was moderated when carbon was also present during sterilization.

- 3116 • Facile Preparation of Starch Triacetates
A. M. Mark and C. L. Mehlretter
Staerke 24(3): 73-76. March 1972

Commercial high-amylose corn, as well as ordinary corn and potato starches, were fully acetylated by reacting the starches at 123° C. for 5 hours in fourfold quantities of acetic anhydride to which 11% (w/w starch) of sodium hydroxide catalyst had been added as a 50% aqueous solution. Intrinsic viscosities of the starches regenerated from their esters were slightly lower than the values for the corresponding unreacted starches and indicated that only minor degradation had occurred during acetylation. Amylose obtained by the butanol fractionation of corn starch was also readily acetylated by this procedure. However, commercial potato amylose required removal of the small amount of magnesium sulfate present to achieve both full acetylation (44.8% acetyl) and minimum depolymerization of the starch.

- 3117 • The Catalase Test. An Aid in the Identification of *Bacillus larvae*
William C. Haynes
Amer. Bee J. 112(4): 130-131. April 1972

If a quick and simple method for the presumptive diagnosis of *Bacillus larvae* in pure culture is needed, the catalase test is superior to the nitrite test.

3118 • *Tephrosia vogelii*: A Source of Rotenoids for Insecticidal and Piscicidal Use

M. H. Gaskins,¹ G. A. White,¹ F. W. Martin,¹ N. E. Delfel,
E. G. Ruppel,¹ and D. K. Barnes¹

(¹USDA Plant Science Research Division, Beltsville, Md.)

U.S. Dept. Agr., Tech. Bull. 1445, 38 pp. April 1972

Tephrosia vogelii Hook. f. is a potential source of rotenone and related rotenoids for insecticidal and piscicidal uses. The United States annually imports more than 1,600 tons of *Derris* and *Lonchocarpus* roots, the main sources of rotenone, for processing. *T. vogelii* is a promising alternative source with adaptability in the Southeastern United States and Puerto Rico. Most of the rotenoids in *T. vogelii* are concentrated in the leaves.

Rotenone and related compounds are used in insecticides and as fish poisons for eliminating undesirable fish in ponds. The demand for rotenone-bearing materials for fish poisons is high. Their use in insecticides has waned since the advent of synthetic insecticides. However, with increasing concern over pollution, greater use may be made of natural materials such as rotenone, which presents little residue problem.

T. vogelii, native to Africa, is a tall, shrubby plant. It is used on a small scale as a fish poison, insecticide, shade for coffee seedlings, and for other purposes. The plant may attain a height of 2 to 3 meters in a growing season of 5 to 7 months, but seedling development is slow. Flower color may be purple, red, or white. The compound leaves contain 7 to 12 pairs of leaflets. Rotenoid content and composition vary among breeding lines and accession. Homozygous lines of this self-pollinated plant can be maintained easily.

Rotenone and deguelin are the major rotenoid compounds in *T. vogelii*, but tephrosin and 6a,12a-dehydrodeguelin may be present in small quantities. Rotenone and deguelin are the most toxic of the rotenoids. Fish and insects can be used in bioassays of rotenoids. The effectiveness of deguelin relative to rotenone on organisms to be controlled is under study. The most satisfactory nonspecific test for the rapid estimation of total rotenoid content is a colorimetric method known as the red-color test. Samples meriting careful study can be analyzed by more specific tests such as gas liquid chromatography and thin-layer densitometry.

Production costs for *T. vogelii* should be similar to those of soybeans, peanuts, and cotton. Harvesting costs can be estimated by comparison with harvesting costs for forage crops. A preliminary economic assessment for *T. vogelii* as a new crop appears favorable provided field yields of 2.5 metric tons dry basis or more can be obtained and if seed production can be satisfactorily developed.

- 3119* • Life with PALS--A User Status Report on an 1800 Monitor
 J. O. Ernst, R. O. Butterfield, D. J. Wolf, and H. J. Dutton
 Proc. COMMON Meeting, Kansas City, Missouri, pp. 23-26,
 April 5-8, 1971

The Palo Alto Laboratory System (PALS) is a type III program designed to automate laboratory equipment. The system permits a flexible allocation of machine resources and allows asynchronous users access to varying amounts of core, to dynamic logical tape files on disk, and to any I/O device required. Despite the difficulties of implementing the unsupported version available, PALS evolved, after much labor, into a promising multiple-level programming-operating system.

- 3120* • MPX System Design for Laboratory Automation
 R. O. Butterfield, J. O. Ernst, D. J. Wolf, and H. J. Dutton
 Proc. COMMON Meeting, Los Angeles, California, pp. 71-77,
 December 13-16, 1971

An MPX 1800 computer system designed for laboratory data acquisition should serve as many scientists as possible. To accomplish this goal, we reduced the executive area by including only subroutines needed for data acquisition programs. Additional subroutines were written to make the system more flexible, such as a dynamic allocation of disk-process working storage. Areas are set up with the higher level programs performing data acquisition and the lower level programs handling data reduction. All data are digitized remotely and transferred to the computer in a demand-response mode through a special-purpose multiplexor that expands one data channel to 32. All process area programming is limited to assembler, while V-core supports user-written Fortran programs. To illustrate the system's performance, specific examples are cited from gas chromatography, mass spectroscopy, and process control.

- 3121 • Formation of an Artifact During Methylation of Conjugated Fatty Acids
 Sambasivarao Koritala and W. K. Rohwedder
 Lipids 7(4): 274. April 1972

Commonly employed acidic catalysts, such as boron trifluoride, sulfuric acid, and perchloric acids, produced an artifact when methyl esters of conjugated isomers of linoleic acid were prepared. This artifact was isolated and characterized as methyl methoxyoctadecenoate. Methylation with diazomethane did not form the artifact.

3122 • Scanning Electron Microscopy of Soybeans

W. J. Wolf and F. L. Baker

Cereal Sci. Today 17(5): 124-126, 128-130, 147. May 1972

Whole soybeans, hulls, cotyledons, cotyledon sections, defatted flours, and isolated protein bodies were examined with a scanning electron microscope. Protein bodies from 1 to 10 μ in diameter were readily observed in defatted cotyledon sections and defatted flours, but protein bodies isolated by sucrose density gradient centrifugation were only from 1 to 3 μ in diameter. The larger protein bodies apparently did not survive the isolation procedure.

3123 • Defatted Germ Flour--Food Ingredient from Corn

C. W. Blessin, G. E. Inglett, W. J. Garcia, and W. L. Deatherage

Food Prod. Develop. 6(3): 34-35. May 1972

A flour containing approximately 25% protein was prepared from commercial dry-milled corn germ. It was evaluated in cookies, muffins, and broiled beef patties. The nutrient supplement could be added to beef patties up to 10% and used in cookies and muffins as a replacement for wheat flour up to 25% without any significant flavor changes. Possibly this low-fat flour could improve the nutritive qualities of many foods.

3124* • Fermented Soybean Foods

C. W. Hesseltine and H. L. Wang

Proc. 3rd Int. Conf. Global Impacts of Appl. Microbiol., eds.

Y. M. Freitas and F. Fernandes, University of Bombay, Bombay, India, December 7-12, 1969, pp. 403-420. 1971

As an important part of diets around the world, fermented foods offer some advantages over other food products. Some examples are: sufu, tempeh, magou, and Bantu beer. The first is a Chinese mold fermentation of tofu that gives a cheeselike product. Tempeh is a mold fermentation of dehulled soybeans carried out in the East Indies. Magou is fermented from white corn meal in South Africa. Bantu beer is made from sorghum and maize in South Africa, with a current production of 150 million imperial gallons per year. The two South African fermentations are examples of how primitive native fermentations may become highly industrialized. Research on sufu and tempeh at the Northern Division is described.

3125* • Gas-Liquid Chromatography of Alditol Acetates

J. H. Sloneker

Methods Carbohyd. Chem. 6: 20-24. 1972

A method is described by which seven aldoses can be determined simultaneously in biological materials by gas-liquid chromatography.

3126* • Quantitative Thin-Layer Chromatography

R. E. Wing and J. N. BeMiller¹¹Southern Illinois University, Carbondale)

Methods Carbohyd. Chem. 6: 54-59. 1972

Thin-layer chromatography is an excellent analytical tool for the carbohydrate chemist. Methods are reviewed for analyzing carbohydrates quantitatively.

3127 • Lipid Metabolism During Bacterial Growth and Sporulation: Phospholipid Pattern in *Bacillus thuringiensis* and *Bacillus popilliae**Bacillus popilliae*

Lee A. Bulla, Jr. and Grant St. Julian

In "Spores V," eds. H. O. Halvorson, R. Hanson, and L. L. Campbell, Proc. 5th Int. Spore Conf., Fontana, Wisconsin, October 8-10, 1971, pp. 191-196. 1972

The proportion, amount, and turnover rate of individual phospholipids were determined along with the timing of their metabolism during growth and sporulation. The phospholipids examined are those known to be common to both organisms: diphosphatidylglycerol, phosphatidylglycerol, phosphatidylethanolamine, and lysophosphatidylethanolamine. Phosphatidylglycerol predominated throughout the culture cycle of *Bacillus thuringiensis* and *B. popilliae*. During sporulation of *B. thuringiensis*, the amount of phosphatidylglycerol increased with a concomitant decrease in diphosphatidylglycerol; the level of the other components remained about the same. During stationary growth of *B. popilliae*, phospholipids did not increase appreciably; however, all components decreased during the death phase. In both organisms, significant differences occurred in turnover rates of the individual phospholipids and in the timing of phospholipid metabolism while cellular development took place. Metabolism of phospholipid phosphate was highest in all of the components examined during exponential growth. At the end of this growth phase, cells of *B. thuringiensis* that entered the sporulation cycle exhibited significant turnover of only diphosphatidyl- and phosphatidylglycerol. Phospholipid metabolism in *B. popilliae* was essentially nonexistent during stationary phase.

- 3128 • Bioproduction of Ochratoxin A and Penicillic Acid by
Members of the *Aspergillus ochraceus* Group
Alex Ciegler
Can. J. Microbiol. 18(5): 631-636. May 1972

Various strains of species belonging to the *Aspergillus ochraceus* group (*A. ochraceus*, *A. sclerotiorum*, *A. alliaceus*, *A. ostianus*, *A. melleus*, and *A. sulphureus*) can produce two mycotoxins, ochratoxin A and penicillic acid, on liquid media and in cereal grains. The quantity of each toxin produced is influenced by temperature; low temperature (10° and 20° C.) favor penicillic acid synthesis and higher (28° C.), ochratoxin A production. Generally penicillic acid is produced in yields about one to three magnitudes greater than ochratoxin A. A simple fluorodensitometric method for concomitant quantitative analysis of the two toxins has been developed based on conversion of penicillic acid and ochratoxin A to fluorescent derivatives by treatment with ammonia fumes.

- 3129 • Glucose Isomerase Covalently Bound to Porous Glass Beads
G. W. Strandberg and K. L. Smiley
Biotechnol. Bioeng. 14(3): 509-513. May 1972

Glucose isomerase from *Streptomyces phaeochromogenes* NRRL B-3559 was covalently attached to porous glass beads. A 50 to 60% loss in enzyme activity occurred on binding. The glass-bound enzyme had a temperature optimum of 80° C. and showed much greater stability than the free enzyme. The free enzyme is inactivated in 3 to 4 hours in a batch reaction. Under similar conditions the glass-bound enzyme retained about one-half of its activity after 24 hours. When used as a column, however, approximately one-half of the activity of the glass-bound enzyme remained after 12 to 14 days of continuous operation.

- 3130* • Use of Xanthates in Synthetic Carbohydrate Chemistry.
Thionocarbonate, Chlorothioformate, Dithiocarbonate,
Trithiocarbonate, and *S*-(Methylthio)carbonyl Derivatives
W. M. Doane
Methods Carbohyd. Chem. 6: 413-418. 1972

Carbohydrate xanthates convert readily into the corresponding dithiobis-(thioformate) or *O*-(alkylthio)thiocarbonyl derivatives. In turn, dithiobis(thioformates) are useful intermediates for the preparation of carbohydrate thionocarbonate, chlorothioformate, and thio derivatives. *O*-(Alkylthio)thiocarbonyl groups can be used to form unsaturated and thio sugars.

- 3131 • Reactivity of Modified Starches with Isocyanates
 F. H. Otey, R. P. Westhoff, and C. L. Mehltretter
 Staerke 24(4): 107-110. April 1972

Various substituents were added onto starch by means of esterification or etherification so that their effect on reactivity of starch with isocyanates in a nonpolar solvent could be studied. Maximum reactivity of the modified starches was achieved when the degree of substitution (D.S.) was about 0.7. Cured urethane plastics made from formulations containing 20% of the starch derivatives demonstrated maximum breaking energy at D.S. 0.7.

- 3132 • Thio Sugars by Decomposition of Carbohydrate
 Dithiobis(thioformates)
 D. Trimmell, W. M. Doane, and C. R. Russell
 Carbohyd. Res. 22(2): 351-359. May 1972

When certain dithiobis(thioformates) are decomposed, yields of 6-thio sugars are moderate to good. Bis(methyl 2,3-di-*O*-methyl- α -D-glucopyranoside) 6,6'-[dithiobis(thioformate)], bis(methyl 2,3,4-tri-*O*-methyl- α -D-glucopyranoside) 6,6'-[dithiobis(thioformate)], and methyl 2,3-di-*O*-methyl- α -D-glucopyranoside 4,6-[dithiobis(thioformate)] on treatment with pyridine gave corresponding dithiocarbonates in which thiolation at C-6 had occurred. Structures of the dithiocarbonates were deduced from spectral data, conversion to known compounds, and, with one, independent synthesis. Dithiobis(thioformates) on secondary positions gave no thio sugar.

- 3133 • Homogeneous Hydrogen-Transfer Reactions Catalyzed by
 Tricarbonylchromium Complexes. Hydrogenation of Trienes
 E. N. Frankel
 J. Org. Chem. 37(10): 1549-1552. May 1972

Hydrogenating 1,3,5-cycloheptatriene with methyl benzoate-Cr(CO)₃ yields a mixture of 1,3-cycloheptadiene and cycloheptene. The formation of 1,3- instead of 1,4-cycloheptadiene is in contrast to the results obtained with acyclic conjugated trienes. Deuteration experiments rule out 1,6 addition and support a mechanism involving 1,4 reduction followed by rapid isomerization of 1,4- to 1,3-cycloheptadiene (1,3-hydrogen-deuterium shift). Catalytic hydrogenation of *trans*-1,3,5-hexatriene with methyl benzoate-Cr(CO)₃ yields *cis*-1,4-hexadiene as the most important intermediate, the product expected from 1,4 addition. Hydrogenation of *cis*-1,3,5-hexatriene gives mainly cyclohexene. This product is derived from 1,3-cyclohexadiene formed by thermal cyclization of the *cis* hexatriene.

3134 • What Is Soy Protein?

W. J. Wolf

Food Technol. 26(5): 44-54. May 1972

This review deals with cellular structure of soybeans and with the physical and chemical properties of soybean proteins. Reactions and interactions of 7S and 11S proteins, the two major soybean globulins, are emphasized.

3135 • Polarimetric Determination of Starch in Corn with Dimethyl Sulfoxide as a Solvent

W. J. Garcia and M. J. Wolf

Cereal Chem. 49(3): 298-306. May-June 1972

Polarimetric starch analyses in which starch is extracted from the corn kernel with 90% dimethyl sulfoxide (DMSO) at room temperature gave results in good agreement with those of the hot calcium chloride extraction customarily used. Recovery of different starches from corn varied in the following order of increasing difficulty: High-amylose, waxy, and ordinary. High-amylose starch was readily extractable; however, length of grinding and agitation time with DMSO governed the completeness of extraction of waxy and ordinary corn starches. More than 98% of the starch was recovered from amylomaize, waxy, and ordinary corn after 3, 6, and 9 minutes, respectively, of grinding in 90% DMSO. Heating (at 55° C.) without adequate shaking and grinding did not ensure quantitative starch recovery from ordinary and waxy corn. Such optically-active substances in corn as hemi-celluloses, zein, and sugars did not interfere with starch determination by the new method. Rapid and accurate polarimetric readings were made by consecutively introducing sample solutions to a flow-through cell assembly.

3136 • Preparation and Properties of Carbamoylethyl Wheat Flour

H. E. Smith, H. C. Katz, S. H. Gordon, and C. R. Russell

Cereal Chem. 49(3): 336-342. May-June 1972

Ungelatinized, crude, and refined carbamoylethyl ethers of wheat flour (CEWF) were prepared by an alkali-catalyzed addition of acrylamide to flour. Best results were obtained from reactions run at 40° to 42° C. for 18 hours. Under these conditions yields of crude and refined CEWF's, based on the combined weights of dry flour and acrylamide, ranged from 77 to 86% and 73 to 84%, respectively. The CEWF's are stable, free-flowing, odorless, practically colorless, and exhibit shelf-life of more than 1 year without change in composition or performance. Differential infrared spectroscopy and nitrogen analyses suggest that carbamoylethyl groups were introduced into both the starch and gluten components of wheat flour during carbamoylethylation. Amylograph studies show that carbamoylethylation decreases the

gelatinization temperature range and greatly improves the pasting characteristics of flour. Heat-gelatinized aqueous pastes of refined CEWF's (2% by weight) exhibit excellent clarity and film-forming properties and have Brookfield viscosities ranging from 375 to 7.5 cP. at 25° C. and 30 r.p.m. Addition of hypochlorite-treated CEWF at a 2% level to unbleached kraft furnishes gave handsheets exhibiting wet-tensile strength about 16-fold that of the control.

3137 • Microbial Reduction in Stored and Dry-Milled Corn
Infected with Southern Corn Leaf Blight

C. Vojnovich, R. A. Anderson, and J. J. Ellis
Cereal Chem. 49(3): 346-353. May-June 1972

Much of the 1970 corn crop was damaged by *Helminthosporium maydis*, the fungus causing southern corn leaf blight. For many uses of corn, particularly in dry-milling, low bacterial and fungal counts are essential. High microbial populations, including *H. maydis*, can be materially reduced or eliminated by certain treatments applied to corn before milling. Blight-infected corn with an initial microbial count of 1,700,000 bacteria and 110,000 fungi per gram was treated by dipping in a hot solution of a sanitizing agent, by indirect steaming, and by direct steaming. Any of the three treatments reduced the microbial count of dry-milled fractions to about 5,000 per gram or lower. Storage of blight-infected corn at moderate temperatures destroyed *H. maydis* and reduced the total microbial count to levels low enough to meet all microbiological specifications set for food products.

3138 • Flavor and Oxidative Stability of Northern-Grown
Sunflower Seed Oil

G. R. List, C. D. Evans, and Helen A. Moser
J. Amer. Oil Chem. Soc. 49(5): 287-292. May 1972

Flavor and oxidative stabilities of a northern-grown sunflower seed oil were investigated. Taste panel and oxidative evaluations were made on alkali-refined, deodorized, unbleached samples treated with commercial antioxidant mixtures, phenolic antioxidants, metal scavengers, and added trace metals. Similar evaluations were conducted on a sample of the same oil after bleaching. Commercial antioxidant mixtures containing both phenolic antioxidants and a metal scavenger improve the flavor and oxidative stabilities of refined unbleached oil. Although phenolic antioxidants alone improve oxidative stability as measured by the active oxygen method test, flavor stability did not improve significantly for antioxidant-treated refined, unbleached samples after accelerated storage. Conversely, alkali-refined and bleached sunflower oil responded to treatment with certain phenolic antioxidants. Although iron and copper are deleterious to oil stability at concentrations of 0.1 p.p.m., such metal-inactivating agents as citric acid are effective in improving flavor stability.

- 3139 • Esterification and Transesterification of 9(10)-Carboxystearic Acid and Its Methyl Esters. Kinetic Studies
E. J. Dufek, R. O. Butterfield, and E. N. Frankel
J. Amer. Oil Chem. Soc. 49(5): 302-306. May 1972

9(10)-Carboxystearic acid and its mono- and dimethyl esters were esterified and transesterified with 1-butanol, 2-methoxyethanol, 2-chloroethanol, 2,2-dimethylpentanol, 2-ethylhexanol, and 1-octanol. Rate studies for the sulfuric acid-catalyzed esterification of 9(10)-carboxystearic acid to alkyl 9(10)-carboxystearate and alkyl 9(10)-carboalkoxystearate indicate that on an average the terminal carboxyl is approximately 26 to 27 times more reactive than the branched carboxyl group. Esterification is highly dependent on catalyst concentration. Steric hindrance in 2,2-dimethylpentanol and the electrophilic character of 2-methoxyethanol and 2-chloroethanol markedly retard the rate. In addition to the expected diesters, 2-chloroethanol yields esters containing extra $-O-CH_2CH_2-$ groups. The rate of transesterification of the terminal ester group of mono- and dimethyl esters of 9(10)-carboxystearic acid is about two times faster than the rate of esterification of the branched carboxyl group. Transesterification of the branched 9(10)-ester group is extremely slow.

- 3140 • Deoxyharringtonine, A New Antitumor Alkaloid from *Cephalotaxus*: Structure and Synthetic Studies
K. L. Mikolajczak, R. G. Powell, and C. R. Smith, Jr.
Tetrahedron 28(7): 1995-2001. April 1972

A new alkaloid (proposed name, deoxyharringtonine) with significant anti-leukemic activity has been isolated from *Cephalotaxus harringtonia* (Forbes) K. Koch var. *harringtonia* cv. *Fastigiata*, and its structure has been determined. Deoxyharringtonine, harringtonine, and two other *Cephalotaxus* alkaloids are esters of cephalotaxine that differ only in the carboxylic acid side chain. The side chain of deoxyharringtonine has the structure: $CH_3O_2CCH_2C(OH)(CO_2-)CH_2CH_2CH(CH_3)_2$. The dicarboxylic acid corresponding to this moiety has been synthesized by condensing 5-methyl-2-hexanone with diethyl carbonate, followed by reaction of the resulting β -keto ester with HCN. Hydrolysis of the cyanohydrin ester gave the desired dicarboxylic hydroxy acid. When saponified with one equivalent of base, the dimethyl ester of this acid yielded the half ester with a free primary carboxyl group. When this half ester was esterified with cephalotaxine, a compound was produced that differed from deoxyharringtonine. This result and spectral data demonstrate that deoxyharringtonine has its cephalotaxine moiety esterified with the more hindered tertiary carboxyl group of the side chain.

- 3141 • A New Amino Acid, (-)-1-Methyl-3-carboxy-6,7-dihydroxy-1,2,3,4-tetrahydroisoquinoline, from Velvet Beans
M. E. Daxenbichler, R. Kleiman, D. Weisleder, C. H. VanEtten, and K. D. Carlson
Tetrahedron Lett. (18): 1801-1802. April 1972

A new amino acid, structurally related to L-dopa, was isolated in about 0.4% yield from velvet beans. The compound was characterized by not only elemental analyses but also infrared, ultraviolet, nuclear magnetic resonance, and mass spectral data and synthesis.

- 3142 • Radical Addition of Linoleic Hydroperoxides to α -Tocopherol or the Analogous Hydroxychroman
H. W. Gardner, K. Eskins, G. W. Grams, and G. E. Inglett
Lipids 7(5): 324-334. May 1972

Either linoleic acid hydroperoxide (LOOH) or methyl linoleate hydroperoxide react anaerobically with either α -tocopherol (TOH) or its model compound--2,2,5,7,8-pentamethyl-6-hydroxychroman (COH)--to form principally an addition compound of the two reactants. The reaction can be catalyzed either by 1.28×10^{-5} M Fe(III) or by proflavin (0.01%) sensitized by visible light. The presence of air in the reaction terminates the addition, and quinones become the major products from TOH or its model compound. The addition compound synthesized from COH and LOOH (a 4.9:1 ratio of 13-hydroperoxy-*cis*-9,*trans*-12-octadecadienoic acid and 9-hydroperoxy-*trans*-10,*cis*-12-octadecadienoic acid) was used to solve structural details of the bridging function. Three isomers of the addition compound (methyl esterified) were isolated and identified as methyl 11-(2,2,5,7,8-pentamethyl-6-oxychroman)-*cis*-12,13-epoxy-*trans*-9-octadecenoate; methyl 11-(2,2,5,7,8-pentamethyl-6-oxychroman)-*trans*-12,13-epoxy-*trans*-9-octadecenoate; and methyl 11-(2,2,5,7,8-pentamethyl-6-oxychroman)-*cis*-9,10-epoxy-*trans*-12-octadecenoate in order of decreasing abundance. The mechanism appears to be free radical addition brought about by the catalytic formation of alkoxy radicals from the hydroperoxide and chromanoxyl radicals from TOH or its model.

- 3143 • Molecular Weights of Wheat γ_1 - and γ_3 -Gliadins in Various Solvents
Kenneth R. Sexson and Y. Victor Wu
Biochim. Biophys. Acta 263(3): 651-657. May 1972

The molecular weights of wheat gliadin and its components were determined by a computer technique from sedimentation equilibrium data obtained in an ultracentrifuge equipped with a photoelectric scanner. The solvents included 3 M urea plus 0.15 M KCl at pH 6.3, 1 M acetic acid plus 0.01 M KCl at pH 3.0, 0.01 M HCl plus 0.05 M KCl at pH 2.2, 1 M acetic acid plus

0.05 M KCl at pH 3.0, 6 M guanidine-HCl at pH 4.6, 0.0167 M aluminum lactate buffer at pH 3.1, 6 M guanidine HCl at pH 2.9, 8 M urea plus 0.15 M KCl at pH 6.3 and 3.0, and 3 M urea plus 0.15 M KCl at pH 3.1. In 3 M urea plus 0.15 M KCl at pH 3.1, the respective minimum molecular weights for γ_1 - and γ_3 -globulins were 30,300 and 34,700, and also for gliadin and low-molecular weight gliadin (gliadin with the high-molecular weight component removed by a crosslinked dextran column) were 49,200 and 30,300. The molecular weights of γ_1 - and γ_3 -gliadins are determined for the first time.

3144 • *Aspergilli* as Ochratoxin Producers

C. W. Hesseltine, Elsie E. Vandegraft, Dorothy I. Fennell,
Mabel L. Smith, and Odette L. Shotwell
Mycologia 64(3): 539-550. May-June 1972

To determine whether ochratoxin is produced by species of *Aspergillus* other than *A. ochraceus*, 44 strains representative of the nine species composing the *A. ochraceus* group were grown on both pearled wheat and cracked corn in duplicate shaken flasks at 28° C. for 5 days. Rice was a poor substrate for ochratoxin production. Molded substrates were extracted with acetonitrile-water; partially purified extracts were assayed for ochratoxins by thin-layer chromatography. All positive samples were confirmed by solubility in sodium bicarbonate and by preparation of methyl esters. Ochratoxins A and B were found in some strains of *A. sulphureus*, *A. sclerotiorum*, *A. alliaceus*, *A. melleus*, *A. ochraceus*, *A. ostianus*, and *A. petrakii*. No ochratoxin was produced by the one strain of *A. elegans* or any of six strains of *A. auricomus*. Five of nine strains of *A. sclerotiorum* and five of 11 strains of *A. ochraceus* were negative. All seven strains of *A. alliaceus* were positive, but one was at a very low level. Generally, yields of ochratoxin were higher in wheat than in corn. Occasionally, as much ochratoxin B was produced as A. Respective yields of ochratoxins A and B were highest from *A. ochraceus* NRRL 3174 and NRRL 3519. Some strains of most species of the *A. ochraceus* group produce this mycotoxin as a secondary metabolite.

3145 • A New Depsidone from *Aspergillus unguis*

F. H. Stodola, R. F. Vesonder, D. I. Fennell, and D. Weisleder
Phytochemistry 11(6): 2107-2108. June 1972

A new $C_{19}H_{18}O_5$ depsidone (unguinol) of m.p. 203-205° C. was isolated from the mycelium of *Aspergillus unguis* NRRL 5250. The dimethyl ether ($C_{21}H_{22}O_5$) melts at 135-137° C. and the diacetate ($C_{23}H_{22}O_7$) at 142-143° C. Unguinol appears to have the same structure as nornidulin except that the chlorines are not present. The organism *A. nidulans* NRRL 2006, which produces nornidulin, also forms unguinol on a chlorine-free medium. However, *A. unguis* NRRL 5250 does not produce nornidulin when grown on a chlorine-containing medium.

3146 • Crambe

[W. H. Tallent]

North. Market. Nutr. Res. Div.

U.S. Agr. Res. Serv., CA-71-36, 4 pp. June 1972 [Processed]

A member of the mustard family (Cruciferae), the crambe plant grows about 3 feet tall and produces a great number of seeds borne singly in spherical pods or hulls. Flowering is indeterminate, but the early formed pods usually adhere until later ones mature. As of June 1972, two named varieties, Prophet and Indy, are available--both released by the Purdue Agricultural Experiment Station, Lafayette, Indiana. Prophet is a selection from *Crambe abyssinica*; Indy is from *Crambe hispanica*. A major advantage claimed for Indy over Prophet is a shorter growing time--75 to 80 days vs. 90 days to maturity. In some regions, domestic production of two crops per year may be feasible. As harvested, so-called seed of both varieties contain about 30% pericarp and 31-32% oil. Dehulling leaves the true seed whose oil content is approximately 45%. Current yields of seed-plus-pericarp are around 1,000 to 2,000 pounds per acre; further increases are anticipated as new varieties are developed and cultural practices are improved.

Traditionally, U.S. companies requiring erucic acid and oil containing it have been dependent upon rapeseed-growing countries for raw material. Current trends in most of these countries toward production of low-erucic rapeseed varieties for improved nutritional quality of the oil have increased the importance of crambe as a domestic source of high-erucic oil for nonedible industrial purposes.

3147 • Crosslinked Protein Glue Containing Chicken Blood for Interior-Type Plywood

F. B. Weakley, W. B. Roth, C. L. Mehltrittter, and Douglas Hamm¹

(¹Southeastern Regional Research Laboratory, Athens, Ga.)
Poultry Sci. 51(2): 378-381. March 1972

Soluble dried chicken blood was evaluated as an ingredient of a protein glue for interior-type plywood manufacture. Yellow birch and southern yellow pine plywood panels meeting industry's standard for bond quality were prepared using a 1:1 chicken blood-soy flour mixture crosslinked with dialdehyde starch. The results obtained show promise for a new large-volume use for poultry blood.

- 3148 • Toxic Effects of a Butenolide Mycotoxin and of
Fusarium tricinctum Cultures in Cattle
 H. L. Tookey, S. G. Yates, J. J. Ellis, M. D. Grove,
 and R. E. Nichols¹
 (¹University of Wisconsin, Madison)
 J. Amer. Vet. Med. Ass. 160(11): 1522-1526. June 1972

The butenolide, 4-acetamido-4-hydroxy-2-butenolide acid γ -lactone, given orally or by ruminal fistula, and cultures of *Fusarium tricinctum* administered intraruminally are toxic. The toxic effects are not predicated on tall fescue as a maintenance ration. The most obvious signs common to animals given either 4-acetamido-4-hydroxy-2-butenolide acid γ -lactone or moldy hay and to the fescue foot syndrome are pathologic changes seen in the tail.

- 3149 • Linear Programming Controls Amino Acid Balance in
 Food Formulation
 J. F. Cavins, G. E. Inglett, and J. S. Wall
 Food Technol. 26(6): 46, 48-49. June 1972

Controlling the quality of protein as well as quantity is imperative when cereal grains form a large proportion of the diet for preschool children. It is possible using a new linear programming model to formulate foods with a prescribed essential amino acid pattern. Formulations prepared according to this procedure have been evaluated with respect to protein efficiency ratio and organoleptic value.

- 3150 • Starch-Cerium(IV) Complexes in Aqueous Media: Formation,
 Isolation, and Stability
 L. A. Gugliemelli, W. M. Doane, C. R. Russell, and
 C. L. Swanson
 J. Polym. Sci., Part B, 10(6): 415-421. June 1972

A method was developed to study the effects of reaction conditions on the formation and stability of starch-cerium(IV) complexes. Such complexes are precipitated from aqueous dispersions with ethyl alcohol and then ashed under oxidative conditions to CeO_2 .

The extent of cerium(IV)-diol formation in waxy corn starch dispersions depends on the concentration of HNO_3 in the ceric ammonium nitrate reagent; an acidity of 0.01 *N* HNO_3 results in 95% formation, whereas an acidity of 10 *N* results in only 15% formation.

Rates of cerium-diols complex disproportionation were less than 1% per hour at 5°, about 2% at 25°, and about 4% at 45°.

- 3151 • Flame-Retardant Rigid Polyurethane Foam from Allyl Glucosides
F. H. Otey, R. P. Westhoff, and C. L. Mehlretter
J. Cell. Plast. 8(3): 156-159. May-June 1972

The stepwise reaction of 1 mole of α -D-glucose with 0.8 mole allyl alcohol, 4 to 5 moles propylene oxide, and 0.8 mole bromine yielded polyethers that were easily incorporated into standard urethane formulations to produce flame-retardant foams. The foams contained about 10% bromine, had compressive strengths of 25 to 30 pounds per square inch, had densities of 1.8 to 1.9 pounds per cubic foot, expanded 12 to 14% during humid aging for 1 month at 158° F. and 100% humidity, retained their flame resistance during the humid aging, and appear economically feasible.

- 3152 • Kinetics of Copper-Chromite Hydrogenation in Soybean and Linseed Oils: Effect of Pressure
P. Y. Vigneron,¹ S. Koritala, R. O. Butterfield, and H. J. Dutton
(¹Lesieur Cotelte Co., Dunkirk, France)
J. Amer. Oil Chem. Soc. 49(6): 371-375. June 1972

Although a prime impetus for study of copper catalysts has been the selective reduction of linolenic acid in soybean oil, recent economic developments raise the possibility that hydrogenated linseed oil might be a suitable edible oil. Consequently, the effect of two hydrogen pressure levels in soybean and linseed oils on the kinetic pathway and on the final distribution of residual double bonds was investigated. The course of the reaction was studied by removing a sample at intervals corresponding to a small iodine value drop, and constituents were determined analytically. The higher pressure increased the rate of reduction, decreased the concentration of conjugated dienes and somewhat reduced the migration of double bonds.

- 3153* • Purification and Properties of the Proteins
W. J. Wolf
In "Soybeans: Chemistry and Technology," eds. Allan K. Smith and Sidney J. Circle, vol. 1, chap. 4, pp. 93-143. Westport, Conn. 1972

A review of the methods used for fractionating and purifying soybean proteins. Physical and chemical properties of purified soybean protein components are also summarized.

3154* • Organic Solvent Treatment of Soybeans and Soybean Fractions

A. C. Eldridge

In "Soybeans: Chemistry and Technology," eds. Allan K. Smith and Sidney J. Circle, vol. 1, chap. 5, pp. 144-157. Westport, Conn. 1972

The organic lipophilic solvent used throughout the soybean processing industry is a low-molecular-weight hydrocarbon usually referred to as hexane. It is an excellent solvent for triglycerides and other lipids, low in cost, and so effective that it is not likely to be replaced by another solvent when the defatted meal is intended as animal feed.

When the meal from hexane extraction is desolventized at a low temperature, it has a bitter-beany flavor and in this state the meal is not acceptable in most food products. When the meal is desolventized with steam, most of the undesirable flavors are eliminated and the meal can be processed for use in many foods. However, steaming may be detrimental for certain food applications. Normally, nutty flavors develop when soybean meal is heated; these flavors may be desirable or undesirable depending on end use of the meal. Because steam also causes denaturation of the protein, heat-treated meals are inappropriate for protein isolation.

Because of increasing interest in high-protein foods, attention has been given to finding a new solvent or a combination of solvents that will completely remove any undesirable flavors, along with the oil, to produce a truly bland soybean meal. This chapter evaluates the research on organic solvents, other than hexane, that have been investigated or used to improve flavor and color or to modify the properties of soybean meal, protein concentrates, and isolates.

3155* • Biologically Active Components

J. J. Rackis

In "Soybeans: Chemistry and Technology," eds. Allan K. Smith and Sidney J. Circle, vol. 1, chap. 6, pp. 158-202. Westport, Conn. 1972

In soybeans are present an unusually large number of thermostable and heat-labile substances, capable of eliciting diverse nutritional, biological, and physiological responses in man and animals. These substances account for the low food value of raw soybean protein products. The processing required to convert soybeans into edible products affects their nutritional value. Also significant are enzymes, proteinase inhibitors, hemagglutinins, allergenic and flatulence factors, saponins, sterols, goitrogens, phenolic constituents, and the growth-vitamin-mineral factors.

3156* • Fermented Soybean Food Products

C. W. Hesseltine and H. L. Wang

In "Soybeans: Chemistry and Technology," eds. Allan K. Smith and Sidney J. Circle, vol. 1, chap. 11, pp. 389-419. Westport, Conn. 1972

Soybeans have been an important source of protein, fat, and flavor for Oriental people for thousands of years. While a large variety of foods were developed from soybeans, the four most important were miso, shoyu (soy sauce), tempeh, and tofu. While the fermented products, miso and shoyu, contribute amino acids to the diet, their contribution is more in flavor than in nutrition. Having a high content of protein and fat, tofu contributes substantially to nutrition. Tempeh, which is used mostly in Indonesia, has a good flavor and is also rich in both protein and fat.

The development of fermented foods, which depend on rather sophisticated microbiology, was a remarkable achievement in the early history of China. There is considerable evidence that Buddhist priests, who taught the people to avoid eating meat, were largely responsible for the development of fermented foods in the Orient. Somewhat lesser known fermented products are natto, hamanatto, and sufu, as well as an American cheeselike product developed recently. The ancient methods of making fermented foods are changing rapidly through the introduction of modern microbiology and technology. Today, Japan has become a leader in the field of industrial microbiology.

To make some of these products, fermentation is carried out directly on cooked soybeans with a selected organism under specific conditions. In making miso and shoyu, a koji is prepared in a preliminary fermentation that serves as a second stage to ferment a combination of cooked soybeans and cereal; the cereal is usually rice when making miso and wheat when making shoyu. Koji is used also in other fermentations such as distilled spirits (shocca), sake, wine, and other beverages where it serves in place of malt.

3157 • Formation of the δ -Lactone of 3,5-Dihydroxydecanoic Acid by the Fungus *Cephalosporium recifei*

R. F. Vesonder, F. H. Stodola, and W. K. Rohwedder

Can. J. Biochem. 50(4): 363-365. April 1972

The fungus *Cephalosporium recifei* NRRL 5161 produces the δ -lactone of 3,5-dihydroxydecanoic acid, the structure of which was established by its mass spectrum and by its easy dehydration to the lactone of 5-hydroxy-2-decenoic acid.

REPUBLICATION

2032* • 影響黃豆油穩定性的主要因素及最近的發展

Key Factors and Recent Advances in the Flavor Stability
of Soybean Oil [In Chinese]

J. C. Cowan

J. Amer. Soybean Inst.-Taiwan Vegetable Ass. 3(2): 10-18.
February 1972

This translated address was given for members of the Institut des Corps Gras, Paris, France, May 18, 1966. It was previously published in English [J. Amer. Oil Chem. Soc. 43(7): 300A-302A, 318A-321A, July 1966] and in French [Rev. Franc. Corps Gras 13(8-9): 515-527, August-September 1966].

UNOFFICIAL PUBLICATIONS

Listing of Publications and Patents of the Northern Marketing and Nutrition Research Division would not be complete without including some unofficial publications. These are writings by members of the Northern Division staff, and, although written from previously published official material, are of a public service value from the standpoint of review and updating of the literature.

Natural and Synthetic Sweeteners

G. E. Inglett

HortScience 5(3): 139-141. June 1970

Intense Sweetness of Natural Origin

G. E. Inglett

In "Sweetness and Sweeteners," ed. G. G. Birch, L. F. Green, and
C. B. Coulson, pp. 32-41. London. 1971

Miracle Fruit Report

G. E. Inglett

Botanicals, 20 pp. Peoria, Ill. June 1971

Serendipity Berries

G. E. Inglett

Botanicals, 18 pp. Peoria, Ill. August 1971

CONTRACT AND GRANT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with the U.S. Department of Agriculture and supervised by the Northern Marketing and Nutrition Research Division.]

- 239-C • Oxidation of Acetate by Various Strains of *Bacillus popilliae*
L. L. McKay, A. Bhumiratana, and R. N. Costilow
Michigan State University, East Lansing
Appl. Microbiol. 22(6): 1070-1075. December 1971
- 240-C • Physiological Studies of an Oligosporogenous Strain
of *Bacillus popilliae*
Ralph N. Costilow and Wilson H. Coulter
Michigan State University, East Lansing
Appl. Microbiol. 22(6): 1076-1084. December 1971
- 241-C • Starch Graft Polymers. II. Preparation of Graft
Polymers Containing Acrylamide and Acrylic Acid
and Evaluation as Textile Print Paste Thickeners
D. A. Jones and L. F. Elmquist
General Mills Chemicals, Inc., Minneapolis, Minn.
Staerke 24(1): 23-27. January 1972
- 242-C • A Study of Ochratoxin Toxicity in Hens
H. Choudhury, C. W. Carlson, and G. Semeniuk
South Dakota State University, Brookings
Poultry Sci. 50(6): 1855-1859. November 1971
- 243-C* • Qualitative Thin-Layer Chromatography
R. E. Wing and J. N. BeMiller
Southern Illinois University, Carbondale
Methods Carbohydr. Chem. 6: 42-53. 1972

- 244-C* • Preparative Thin-Layer Chromatography
R. E. Wing and J. N. BeMiller
Southern Illinois University, Carbondale
Methods Carbohyd. Chem. 6: 60-64. 1972
- 245-C* • Benzyl Ethers: Formation and Removal. Tri-*O*-benzylamylose and Methyl 4-*O*-Benzyl- β -D-glucopyranoside. Debenzylation Via Sodium in Liquid Ammonia and Via Bromination
R. E. Wing and J. N. BeMiller
Southern Illinois University, Carbondale
Methods Carbohyd. Chem. 6: 368-372. 1972
- 246-C* • C-4 Substitution of Methyl D-Glucosides and Malto-Oligosaccharides
R. E. Wing and J. N. BeMiller
Southern Illinois University, Carbondale
Methods Carbohyd. Chem. 6: 378-384. 1972
- 247-C* • Preparation and Isolation of Acid-Catalyzed Hydrolysates from Wheat Gluten
Catherine Aranyi and E. J. Hawrylewicz
IIT Research Institute, Chicago, Ill.
J. Agr. Food Chem. 20(3): 670-675. May-June 1972

[Report of research done by an outside agency under a grant from the U.S. Department of Agriculture and supervised by the Northern Marketing and Nutrition Research Division.]

- 113-G • Subsite Mapping of Enzymes. Correlation of Product Patterns with Michaelis Parameters and Substrate-Induced Strain
John A. Thoma,¹ G. V. K. Rao,¹ Charles Brothers,¹
Joseph Spradlin,¹ and L. H. Li²
¹University of Arkansas, Fayetteville; ²Indiana University, Bloomington
J. Biol. Chem. 246(18): 5621-5635. September 1971
- 114-G* • Non-Destructive Chromatographic Indicator for (and Quantitative Analysis in) the Paper Chromatography of Carbohydrate Compounds Convertible to Barium Salts
Wallace M. Pasika and Arthur C. West III
Texas A&M University, College Station
J. Chromatogr. 63(2): 357-363. December 1971
- 115-G • Oxidation of Starch by Hydrogen Peroxide in the Presence of UV Light--Part II
Robert E. Harmon, S. K. Gupta, and J. Johnson
Western Michigan University, Kalamazoo
Staerke 24(1): 8-11. January 1972
- 116-G* • Reducing Value Methods for Maltodextrins: II. Automated Methods and Chain-Length Independence of Alkaline Ferricyanide
John F. Robyt, Rosalie J. Ackerman, and J. G. Keng
Iowa State University, Ames
Anal. Biochem. 45(2): 517-524. February 1972
- 117-G* • Amylolytic Isoenzymes of *Thermoactinomyces vulgaris*
Martin J. Allen and Paul A. Hartman
Iowa State University, Ames
J. Bacteriol. 109(1): 452-454. January 1972

- 119-G* • Conformation of the "V" Amylose Helix
Alfred French and B. Zaslow
Arizona State University, Tempe
Chem. Commun. (2): 41-42. January 1972
- 120-G* • Anisotropic Scattering by Single Starch Granules. II.
Layered Granule Structure
R. S. Finkelstein and A. Sarko
State University College of Forestry, Syracuse, New York
Biopolymers 11(4): 881-892. 1972
- 121-G* • Evaluation of Zinc Availability in Foodstuffs
of Plant and Animal Origin
B. L. O'Dell, C. E. Burpo, and J. E. Savage
University of Missouri, Columbia
J. Nutr. 102(5): 653-660. May 1972
- 122-G* • Distribution of Phytate and Nutritionally Important
Elements Among the Morphological Components of
Cereal Grains
Boyd L. O'Dell, Ana R. de Boland, and Samuel R. Koirttyohann
University of Missouri, Columbia
J. Agr. Food Chem. 20(3): 718-721. May-June 1972
- 123-G* • Structural Characterization of the Two Forms of
Glucoamylase from *Aspergillus niger*
D. R. Lineback,¹ L. A. Aira,¹ and R. L. Horner²
¹Kansas State University, Manhattan; ²University of
Nebraska, Lincoln
Cereal Chem. 49(3): 283-298. May-June 1972
- 124-G* • Anisotropic Scattering by Single Starch Granules. Part III.
Transverse Sections of Potato Starch
R. S. Finkelstein and A. Sarko
State University College of Forestry, Syracuse, New York
Carbohydr. Res. 23(1): 31-40. June 1972

[Report of research work supported with funds provided by the U.S. Department of Agriculture under the authority of U.S. Public Law 480, 83rd Congress, and sponsored by the Northern Marketing and Nutrition Research Division.]

- 339-F • The Synthesis of 22-*trans*-Cholesta-5,22,25-trien-3 β -ol
R. Ikan, A. Markus, and E. D. Bergmann
The Hebrew University, Jerusalem, Israel
Isr. J. Chem. 9(2): 259-261. 1971
- 340-F • Organic Reactions in Strong Alkalies. Part V. Alkali
Fusion of Epoxides and Ethers
M. F. Ansell, I. S. Shepherd, and B. C. L. Weedon
Queen Mary College, University of London, London, England
J. Chem. Soc. C(10): 1840-1846. 1971
- 341-F • Organic Reactions in Strong Alkalies. Part VI. Further Studies
on Alkali Fusion Reactions of Keto- and Hydroxy-acids
M. F. Ansell, D. J. Redshaw, and B. C. L. Weedon
Queen Mary College, University of London, London, England
J. Chem. Soc. C(10): 1846-1850. 1971
- 342-F • Organic Reactions in Strong Alkalies. Part VII. Fission of
Unsaturated Acids by Alkali Fusion in Potassium Deuterioxide
M. F. Ansell, A. N. Radziwill, and B. C. L. Weedon
Queen Mary College, University of London, London, England
J. Chem. Soc. C(10): 1851-1856. 1971
- 343-F • The Autoxidation of 9(10)-Hydroxy-10(9)-oxo-octadecanoic
Acid in Alkaline Media
M. F. Ansell, I. S. Shepherd, and B. C. L. Weedon
Queen Mary College, University of London, London, England
J. Chem. Soc. C(10): 1857-1859. 1971

- 344-F • Formation of Hydrogen-Bonded Complexes of D-Galactose, D-Glucose, D-Mannose, and Maltose with Ethylenediamine
S. P. Moulik, A. K. Mitra, and K. K. Sen Gupta
Jadavpur University, Calcutta, India
Carbohydr. Res. 19(3): 416-418. October 1971
- 345-F • Fundamental Studies on the Interaction of Transition Metals with Carbohydrate Derivatives as Ligands. I. Reaction of 2-Deoxy-2-amino-D-glucopyranoside with Salts of Iron, Cobalt and Nickel
C. R. Sahu and A. K. Mitra
Jadavpur University, Calcutta, India
J. Indian Chem. Soc. 48(9): 795-798. September 1971
- 346-F • Quantitation of *N*-Acetyl-D-galactosamine-Like Sites on the Surface Membrane of Normal and Transformed Mammalian Cells
Ben-Ami Sela, Halina Lis, Nathan Sharon, and Leo Sachs
The Weizmann Institute of Science, Rehovot, Israel
Biochim. Biophys. Acta 249(2): 564-568. December 1971
- 347-F • Fundamental Studies on the Interaction of Carbohydrate Derivatives with Alkaline Earth Metals. II. Reaction of Ethanolamine, Ethylenediamine and 2-Aminoglucose with the Halides of Alkaline Earth Metals
S. P. Moulik and A. K. Mitra
Jadavpur University, Calcutta, India
J. Indian Chem. Soc. 48(10): 905-909. October 1971
- 348-F • Synthesis of β -Sitosteryl Acetate [(24*R*)-24-Ethyl-3 β -acetoxcholest-5-ene] and Its 24*S* Epimer
R. Ikan, A. Markus, and E. D. Bergmann
The Hebrew University, Jerusalem, Israel
J. Org. Chem. 36(25): 3944-3945. December 1971

- 349-F • Lipids in Cruciferae: VIII. The Fatty Acid Composition of Seeds of Some Wild or Partially Domesticated Species
L.-A. Appelqvist
Swedish Seed Association, Svalof, Sweden
J. Amer. Oil Chem. Soc. 48(11): 740-744. November 1971

- 350-F • Fundamental Studies on the Interaction of Carbohydrate Derivatives with Alkaline Earth Metals. Reaction of 1,2-*O*-Isopropylidene-*D*-glucose-6-phosphate with Calcium Salts. Part I
C. R. Sahu and A. K. Mitra
Jadavpur University, Calcutta, India
Indian J. Appl. Chem. 34(2): 60-62. 1971

January-June 1972

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PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased (50 cents each) from the Commissioner of Patents, U.S. Patent Office, Washington, D.C. 20231. Order by number, do not send stamps.]

Method for Removing Metals from Vegetable Oils

Robert E. Beal and Roger A. Eisenhauer

U.S. Patent 3,634,475. January 11, 1972

This low-cost continuous method reduces the quantity of certain metals in vegetable oils intended for edible use to near, or below, levels where these metals adversely affect the flavor of the oil or the ability of the oil to resist oxidation. This improved method for reducing metals consists in washing the vegetable oil in a multistage countercurrent manner with water previously treated by passing it through a layer of a cation-exchange resin in the hydrogen form. After it has passed through the continuous countercurrent washing process, the water is again entirely passed through the resin layer and reused for washing a further quantity of oil. The same quantity of water is thus recycled and reused indefinitely and no further water is added to the process, except to replace losses due to evaporation or by other means.

Production of Vegetable Protein Beverage Base

Gus C. Mustakas, William J. Albrecht, and George N. Bookwalter

U.S. Patent 3,639,129. February 1, 1972

This rapid continuous process utilizes vegetable protein flour to produce a highly nutritive protein beverage base powder that can be easily converted to a liquid product by merely adding water.

Polysaccharide-Reinforced Rubber

Howard L. Stephens and Thomas F. Reed

U.S. Patent 3,645,940. February 29, 1972

Moist polysaccharide-rubber coprecipitates are subjected to vigorous hot mechanical working during the critical phase inversion from rubber particles in a polysaccharide matrix to polysaccharide particles in a rubber matrix. This yields masterbatches which have better dispersion of polysaccharide in rubber than has been previously attained, and which provide vulcanizates having greatly improved strengths and elastic properties.

Protein Concentrates from Buffer Treated Cereal Endosperm Products

Donald D. Christianson, Arthur C. Stringfellow, and Joseph S. Wall
U.S. Patent 3,661,593. May 9, 1972

An improvement has been made in processes for preparing protein-enriched products from cereal grains. Protein which envelops starch particles in cereal endosperm is loosened by hydration in an aqueous buffer solution. Standard commercial procedures such as grinding, milling, air classification, or screening can be used to prepare the desired products.

Production of Tremortins A, B, and C

Alex Ciegler and Ching Tsang Hou
U.S. Patent 3,666,630. May 30, 1972

Tremortins A, B, and C are produced in high yield by culturing certain fungi, namely, *Penicillium palitans*, *P. crustosum*, *P. granulatum*, *P. cyclopium*, *P. puberulum*, *P. olivino-viride*, or *P. martensii*.

Flocculants from Starch Graft Copolymers

Duane A. Jones, George F. Fanta, and Robert C. Burr
U.S. Patent 3,669,915. June 13, 1972

Highly active flocculants for removing siliceous wastes and other finely divided solid suspensions from water are produced from starch by graft copolymerization with a cationic monomer having quaternary ammonium substituents.

Powdered Polysaccharide-Reinforced Elastomer Masterbatches, Compounds, and Resulting Vulcanized Rubbers

Russell A. Buchanan and Charles R. Russell
U.S. Patent 3,673,136. June 27, 1972

Powdered elastomer masterbatches are prepared by grinding dried rubber curds which contain highly effective reinforcing agents. Such finely comminuted elastomer masterbatches provide stable powdered rubber compounds when blended with usual powdered curatives and fine particle fillers. These powdered rubber compounds are formed into finished vulcanized rubber articles by direct heat-compression molding, by extrusion from a simple machine, or by injection molding without prior high shear mixing.

LICENSING OF PATENTS

Many inventions and discoveries of the Northern Division are covered by patents assigned to the Secretary of Agriculture.

Assigned patents are available for use by business and industry under either exclusive or non-exclusive licenses. Conditions

applicable to the granting of licenses are set forth in the Federal Register, May 14, 1970 [35(94): 7493-7495]. Further information can be obtained from the Administrator, Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C. 20250.

Other Divisions of
MARKETING AND NUTRITION RESEARCH

Agricultural Research Service

U.S. Department of Agriculture

Eastern Marketing and Nutrition
Research Division
600 East Mermaid Lane
Philadelphia, Pennsylvania 19118

Consumer and Food Economics
Research Division
Federal Center Building
Hyattsville, Maryland 20782

Southeastern Marketing and
Nutrition Research Division
950 College Station Road
Athens, Georgia 30604

Human Nutrition Research
Division
Agricultural Research Center
Beltsville, Maryland 20705

Southern Marketing and Nutrition
Research Division
1100 Robert E. Lee Boulevard
New Orleans, Louisiana 70119

Market Quality Research
Division
Federal Center Building
Hyattsville, Maryland 20782

Western Marketing and Nutrition
Research Division
800 Buchanan Street
Albany, California 94710

Transportation and Facilities
Research Division
Federal Center Building
Hyattsville, Maryland 20782

UNITED STATES DEPARTMENT OF AGRICULTURE
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